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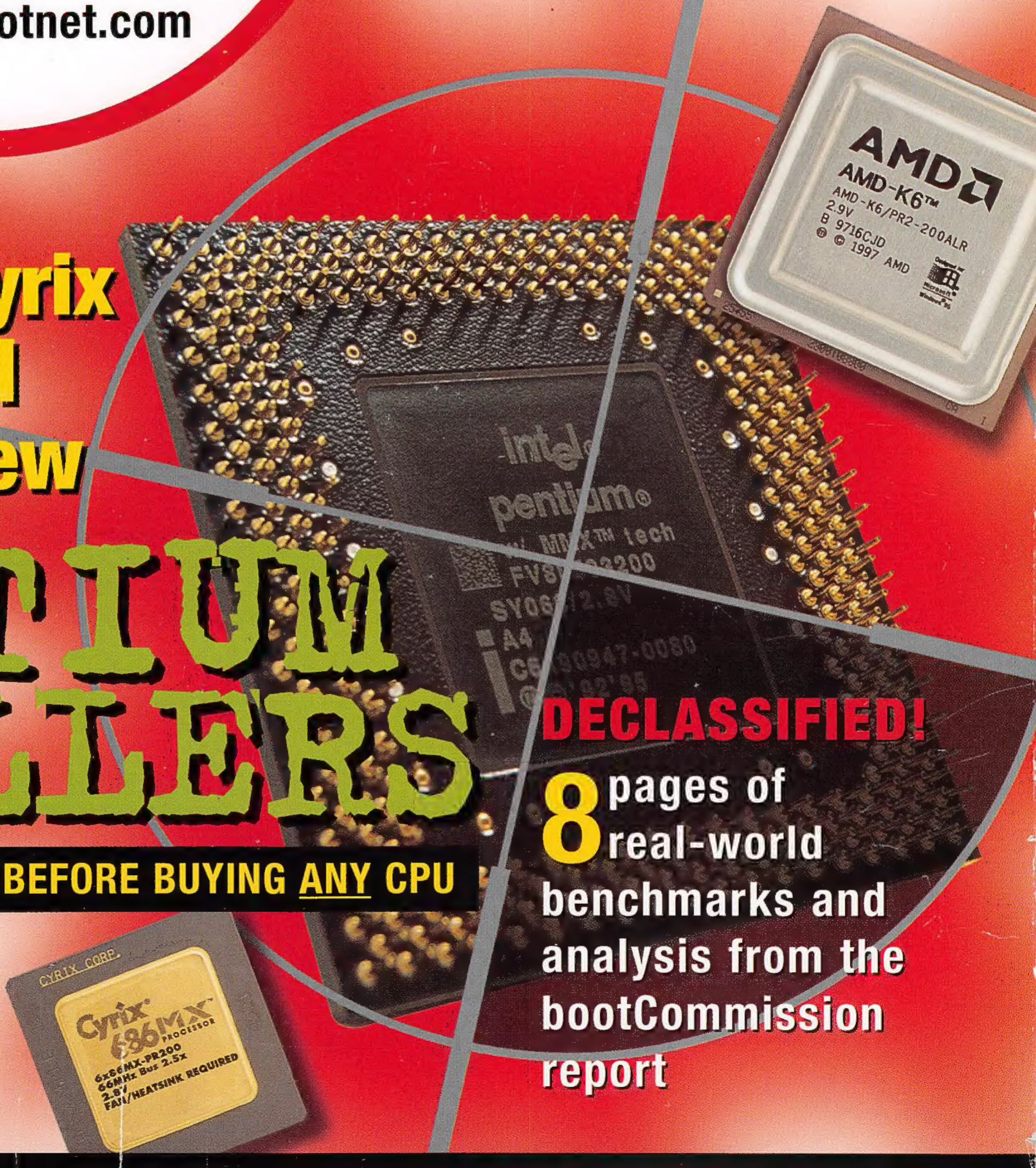
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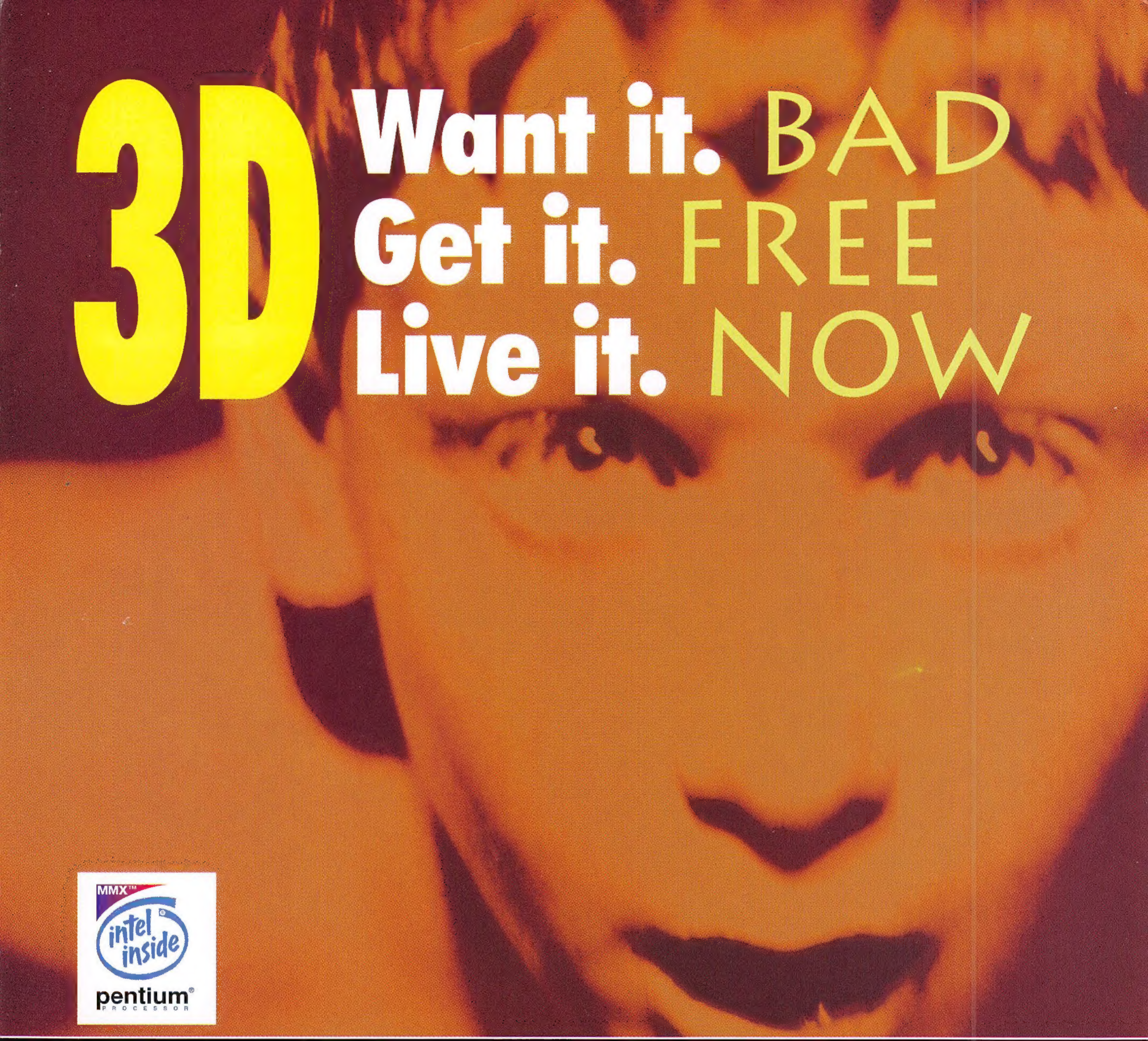

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EDWORD

Promises and Why They Get Broken

Every so often, *boot* makes a big fat promise... and then breaks it.

We go off at the mouth (more literally, at the keyboard) promising this or that coverage: a review of the latest software that threatens to change your life or a mind-altering game that'll have you twitchier than a heroin junkie on a three-day jag; news about Microsoft's next API, OS, or BFD; a step-by-step feature on how the flava-of-the-month plug-in can make your vanity site rust some zippers; the department that you've come to breathlessly await, like Alan Alda waiting for Ellen Burstyn at that coastside hotel in some sappy flick.

Then, nothing.

There you sit, with an empty feeling gnawing at your gut, feeling utterly betrayed. How could this happen? Weren't we buddies? You trusted us!

Let's get this straight.

We *are* buddies. Nothing means more to us than feeding you the straight shot each and every month. Nothing. We don't do this for the tchotchkes that companies throw us (which we then throw in a box destined for a local school). We don't do this for the adulation of the mindless drones working in the PC press. We certainly don't bust our asses 'til the wee hours for just the paychecks. We do it 'cause of our love for PCs and our dedication to our readers. You're the reason we're here.

If we bump a story or a department, trust us, there was damn good reason. We were looking forward to it just as much as you were. Sometimes the reviewable version of a product fails to come in as promised (and we only test stuff deemed reviewable by the company that makes it.) Sometimes a department has to take a month off so we can squeeze in a last-minute preview. Sometimes even a feature has to be sacrificed to free up room for breaking coverage of something we've decided is sexier and more likely to rock your world.

There's always a good reason.

Again, trust us. We won't back off a story for anything. And we'll never pull any punches. Month-in, month-out, we are dead set on delivering the best we can dig up and packing the pages we get from the publisher with the Pure PC Power that has the greatest impact on you, our raison d'etre.

Brad Dosland
Editor in Chief

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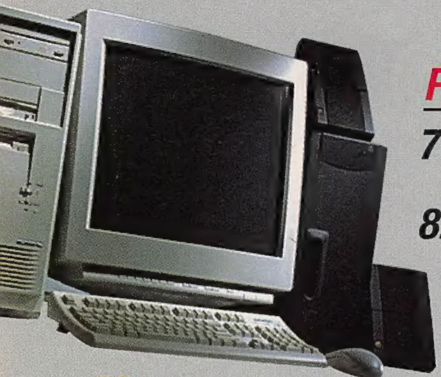
82 Reviews Powerful, **creative** apps—including the latest versions of Director, Illustrator, PageMaker, and LightWave 3D—have provided us with the means to **rule the world** from the **bootLab** nestled in the Himalayas.

— Micron's **"ultimate gaming machine"**
— **Fastest** CD-ROM drive ever from Plextor
— **Dungeon Keeper** imprisons us in it's **spell**



70 Previews

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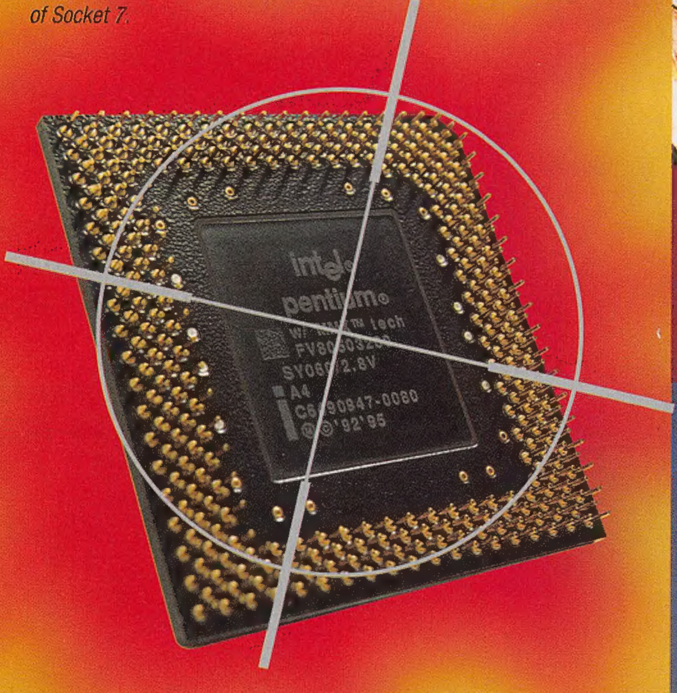
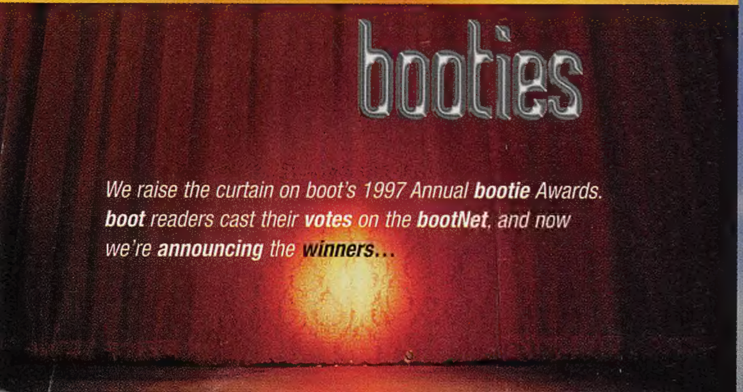
42 The Pentium **Killers**

AMD and **Cyrix** are on a mission to **assassinate** Intel's MMX chip. Are their mercenary processors a couple of **bumbling** hit men, or **high-precision** marksmen you'd be proud to take home to mother? The answer can only be found on the sprawling plaza of Socket 7.





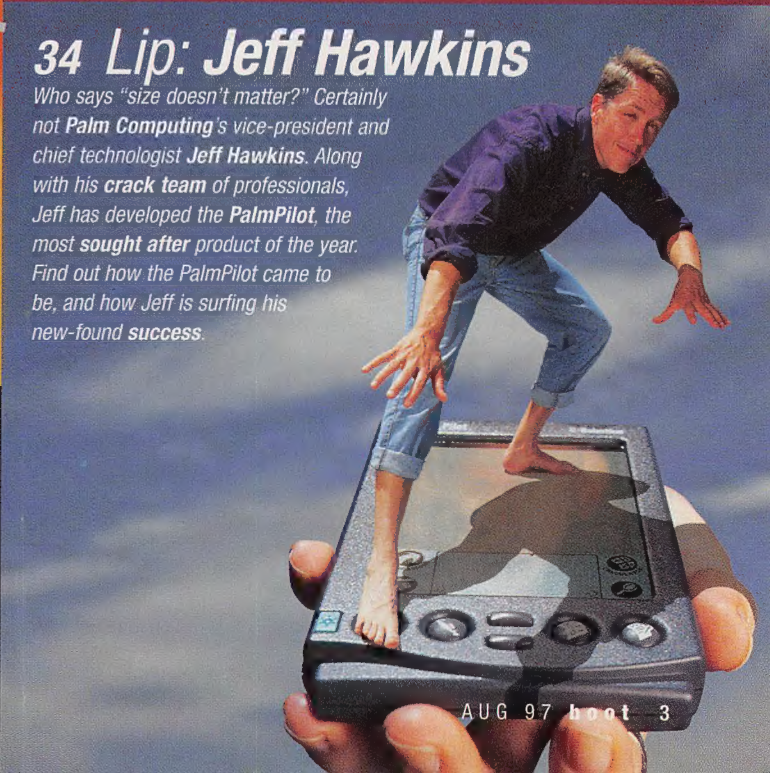
We raise the curtain on boot's 1997 Annual **bootie** Awards. **boot** readers cast their **votes** on the **bootNet**, and now we're **announcing** the **winners**…

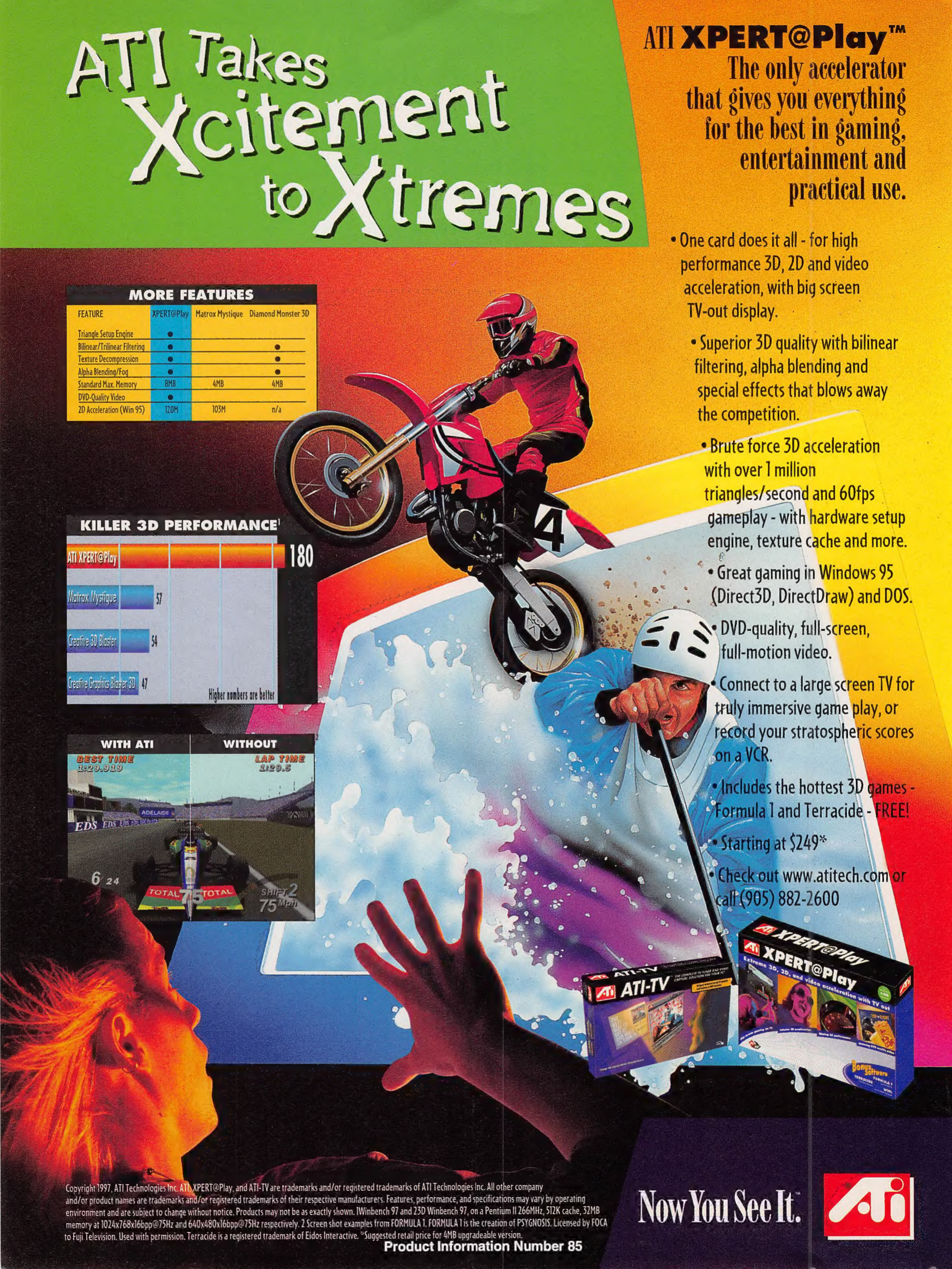
82

With more than $22,000 worth of **circuitry** onboard, **boot** gives you the **ultimate** mobile experience.

34 Lip: **Jeff Hawkins**

Who says "size doesn't matter?" Certainly not **Palm Computing**'s vice-president and chief technologist **Jeff Hawkins**. Along with his **crack team** of professionals, Jeff has developed the **PalmPilot**, the most **sought after** product of the year. Find out how the PalmPilot came to be, and how Jeff is surfing his new-found **success**.





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2D Acceleration (Win 95)	120M	103M	n/a

KILLER 3D PERFORMANCE[1]

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[1] Winbench 97 and [2] 3D Winbench 97, on a Pentium II 266MHz, 512K cache, 32MB memory at 1024x768x16bpp@75Hz and 640x480x16bpp@75Hz respectively. [2] Screen shot examples from FORMULA 1. FORMULA 1 is the creation of PSYGNOSIS. Licensed by FOCA to Fuji Television. Used with permission. Terracide is a registered trademark of Eidos Interactive. *Suggested retail price for 4MB upgradeable version.

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boot

august 1997

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advertising 415.468.4684 ext. 110
editorial 415.468.4684; editor@bootnet.com
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COMM PORT

Speed 3: Back on the Bus

For the life of me, I cannot understand the perpetual hubbub over newer and faster CPUs. Everyone—including *boot*—seems to be ignoring the fact that these quicker chips are delivering only minor improvements in performance. Tell the truth: Haven't we passed the point of diminishing returns?

The hard drive in my new 200MHz MMX system still churns like crazy, leading me to believe that most of today's peripherals can't keep up with these superfast CPUs.

And here's a question that continually drives me nuts: Why does every magazine make such a fuss over the 60MHz bus vs. the 66MHz bus? So the latter is 6MHz faster—how much difference can that really make?

Rick Broida

TECH EDITOR CHRIS DUNPHY REPLIES: *It's an amazing rush to surf the technology curve, and all of us at* boot *have a passion for these amazing machines.*

Sure, if all you want to do is run a word processor, the point of diminishing returns may have been reached. But every day somebody discovers something new to do with these boxes, pushing them just a little further. The latest advances in software need the extra 10 percent in hardware oomph to make their magic possible. Look at Pod *on an MMX machine with a 3D accelerator, and think back to what was possible just a year ago. First spend some time on a Pentium II and then on last year's model. Now tell me with a straight face that you can't feel the difference. This ride ain't getting any slower, and I'm sure not ready to get off.*

Bus speed determines how fast your CPU can access main memory. The faster the bus, the less time your 200MHz monster spends spinning its wheels waiting for data. Benchmarking shows that over-clocking the bus speed to 75MHz or 83MHz has a much bigger impact than upping the CPU clock. So don't go knocking the importance of bus speed, every 10 percent counts.

> *"You should put a* ***warning*** *on the cover to let the* ***non-technoweenie crowd*** *know that this magazine is a little* ***too much*** *for them."*

boot Seeks Assistant Editors

I am totally insane about *boot*. I have to make one suggestion, though. You should put a warning on the cover to let the non-technoweenie crowd know that this magazine is a little too much for them.

I also suggest that you change the phrase above the name on the cover from "For PC Fanatics" to "For PC Stark-Raving-Mad Lunatics." This would be much more appropriate (and true).

If you need more suggestions, let me know. I have plenty to spare. Hey! Wait a minute... There might be money to be made in this. Yeah, that's the ticket. Do you need an assistant editor? I've already given you two suggestions for free. Future suggestions will be billed to you by the minute.

Scott Tarr

Might Deserve Kredit

Just got *MDK*. Good call! I have a run-of-the-mill P100, nothing fancy (yet), and the game looks and runs great. Why can't all games work this well? And what's up with *Unreal*? Is it just more hype? Thanks for being the only computer magazine I read.

Brian Buckham

NEWS EDITOR BRYAN DEL RIZZO REPLIES: *I just returned from a trip to the Great White North to get the skinny on* Unreal*, and rest assured, it isn't vaporware. The game is slated for release in October, and from what I've seen,* Unreal *looks like a winner. If that doesn't whet your appetite, check out the Lip interview in the next issue of* boot*. Tim Sweeney and James Schmalz, co-designers of* Unreal*, reveal everything there is to know about the game (and more) and tell us who could kick Carmack's ass in a street fight.*

Why, Thank You

Oh well, I knew it couldn't last forever. *boot* has officially become another game magazine. OK, OK, not just *any* game mag, but a hyped-up crack baby of a game mag.

I usually buy *boot* for the mix of utilities on the disc, but this month, there were only two, and they were both useless. I like playing games as much as the next guy, it's just that I expected more from a magazine that holds itself above all others.

Ted Phillips

EDITOR IN CHIEF BRAD DOSLAND REPLIES: boot *continues to be dedicated to the best hardware known to man—and the software that fuels the engines. It just happens that much of this is sexy game software. But we also cover 3D graphics apps, sound editors, utilities, DTP, 2D illustration software, and more with the same vigor. Think of us as a hyped-up crack baby of a Pure PC Power magazine.*

You Can Go With This or You Can Go With That

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COMM PORT

For those of us who can't afford both, which upgrade should we invest in that will give us the most mileage for the graphics-intensive, mind-blowing games of the future?

J. Rumsey

HARDWARE REVIEWS EDITOR ANDREW SANCHEZ REPLIES: *Boy, talk about a hard-ass question! If you have a decent CPU, adding a cajones-crunching 3D accelerator will give you the most bang for the buck. Splurging on a 3Dfx card or Rendition card will make those Direct3D games and card-specific ports move like liquid lightning. But a 3D accelerator only goes so far, and then your processor speed comes into play. So if you can't afford both, go for the 3D accelerator first. You can slam that P233 MMX processor on later, and enjoy the 60+fps experience MMX/3Dfx can give ya.*

We Don't Need No Steenkin' DVD

What's going on? As far as I know, a CD-ROM can handle up to about 670MB of data, but I was browsing through the directories of your *bootDisc* 10, and I found a 650MB file on the \BOOTMARK\CDTACH directory and 75MB more taking over the \176 directory... Hold on, that's already 725MB of data! So I did a "dir/w/s," and I found your *bootDisc* 10 took about 1.3GB of disk space. How could it be? Is it a special type of CD that I've never heard about? If it is, can we do the same with recordable CDs?

V.Y. Shin

DISC EDITOR SEAN CLEVELAND REPLIES: *Good eye! I was wondering if anybody would catch this. What you're seeing is indeed reality, but a distorted view of it. The size of the* CDTach *file is not 650MB. The* bootDisc *is cut to an image file and uses software developed by Testa Labs (makers of* CDTach*) to write pointers to the .dat file that point to the beginning and ending sectors of the disc. This enables the* CDTach *software to use the entire contents of the disc to do its tests. When you do a directory listing of that file, it's actually giving you the size of the full contents of the* bootDisc.

"I did a **"dir/w/s,"** and I found out your bootDisc 10 took about **1.3GB of disk space**. How could it be?"

The Clinic's Hours Are...

I have had a subscription to your mag since *boot* 03. When you added the bootClinic in issue 06 I was glad. The best mag I'd ever read had the only thing I read in other PC mags: a help area. When I got *boot* 10, I was amazed to see that there was no more bootClinic. My only hope is that you will keep the White Paper. It rocks.

Andy Kobylarz

EDITOR IN CHIEF BRAD DOSLAND REPLIES: *The clinic's still open; every now and then the doctors just take a month off. But fear not: We never forget our hippocratic oath and White Paper ain't going anywhere either!*

Art Lies in the Joystick of the Beholder

What is it about computer gaming magazines that makes arrogance pour forth from the columnists? Too much time in the absolutist binary world? This seems to be the case with T. Liam McDonald's pronouncement that games cannot be art [Game Theory, *boot* 10].

Briefly, his argument rests on the opinion that "art is not interactive." Mr. McDonald's BFA program apparently did not touch on the Dadaists, Fluxus, or the nearly century-long history of performance art. The interactive aspects of this work should be visible even from Mr McDonald's seat before his little flat screen. It is the height of irony that someone who calls his experiences from this seat "interactive" should deny the appellation to an age-old practice that involves more than just "virtual" reality.

Not that I want to deny the endless interactive enjoyment I get from multimedia (not just games). But after all, what's more interactive: participating in a Dada Soirée, a Fluxus Happening, walking through and shouting at a Buchen sound sculpture to hear the sonic feedback... or shooting at little phantoms on a screen?

Chris Burke
Composer/Producer

COLUMNIST T. LIAM MCDONALD REPLIES: *Mr. Burke trots out some academic chestnuts in his attack on my basic thesis that art isn't interactive, assuming I'm ignorant of them. Please, NYU is a better school than that. I don't care what some critics think (these are the people who made Foucault a god), I don't agree that it's all art.*

Dada *Dadaists said specifically that they weren't art. Case closed.*

Fluxus *Where Dada went when it got old. This was Yoko Ono's shtick, such as when she created "art" by inviting people to cut off her clothes. Is that art?*

Performance art *When someone creates something that isn't funny enough to be stand-up comedy or structured enough to be drama or fun enough to be a good striptease, they called it "performance art." Is that art?*

I have experienced a Dada "Soirée," a Fluxus "Happening," and sound sculpture. I have been told they are art. Forgive me for being dubious.

Fly Away

My wife will allow me to get only one flight sim this year. I have *Falcon 3.* I love it, and I've waited and waited for *Falcon 4.* Is it just vaporware? If it is, then suggest one that would be good for a Cyrix 6x86 with 32MB of RAM and a Matrox Millennium. I've thought about *Jet Fighter III.* I want a very realistic sim even though they are hard to learn. (I have a ThrustMaster WCS + FCS).

Richard W. Hunt

EDITOR IN CHIEF BRAD DOSLAND REPLIES: *Your wife will let you get only one flight sim a year? My recommendation? Get a new wife.*

Welcome to the Twilight Zone

In *boot* 10, columnist Shel Kimen says that "3D is natural. We live in 3D. Our brains are wired for time-spatial memory. Our universe speaks in 3D." If I follow her gist correctly, she says that because of this natural 3D perception, we should expect our computer interfaces to be 3D. Her assumption is that if the computer interface is of the same dimensionality as our natural perception, then that interface will be more effective.

But our natural perception is *not* 3D! Shel herself says we are "wired for time-spatial memory." That refers to four, not three, dimensions. Some folks—myself included—would argue that there are even more dimensions than four. Even if the interface were 3D, it wouldn't be as rich as our natural experience. It turns out that 3D interfaces do not mimic or match our natural perception.

What if our computer interface could match in dimensionality what we naturally perceive? That interface would no longer be an interface, because then it would simply be... real, like the computer hardware. It wouldn't be a window or a tool. Tools are different from the thing they manipulate; if they weren't, we couldn't distinguish between the tool and the thing being manipulated. It is either blocking our view, or it becomes the thing we are looking at.

This is not to say that 3D interfaces are not powerful. It is to say that the likely reason they are powerful is precisely because they don't exist in the same way that other real things exist, as far as our perception is concerned.

Danny J Smitherman

COLUMNIST SHEL KIMEN REPLIES: *I'll see your fourth dimension and raise you a fifth and a sixth, agreed. And also agreed that if the computer could accommodate our "natural" perception there would be no computer, hence "meme splicing," in which biology becomes mechanical and mechanics become biological.*

The point is that 3D user interfaces would better accommodate our general perception of "things" (things that the computer organizes), and it would ultimately make computers that much more accessible for the les linear, non-2D-UI-trained person.

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COMM PORT

The article was more about why and how computers will evolve to a 3D UI and less about 3D as the be all and end all of interface design. It's just a step. Computers will never be able to do what we cannot do for ourselves. 3D UIs will just make it a little easier for us to forget that fact. 3D UIs will also make it easier for others to get along with the technology until it's realized that, as a society, we don't need it. It needs us.

Share a Little, Save a Little

I can't believe more hasn't been written about the lack of a multiplayer Save-Game option in *Quake*. What about those of us who like to progress through the levels as a team of two or more? We can't, because there's no cooperative multiplayer-save option in the game.

I'd love to see an article with id's response. I've asked them by e-mail many times but get no response.

Jason

JOHN CARMACK OF ID SOFTWARE REPLIES: *We didn't have a good mechanism for waiting for multiple people before beginning the game. It's certainly possible, we just didn't have the time.*

NT Nest Syndrome

I have recently run into some problems regarding the game industry. I have upgraded my system to a dual Pentium 200 Asus motherboard, 128M of RAM, 3.3GB hard drive, 16x CD-ROM, Matrox Millennium 2D video card, and a Diamond Monster 3D accelerator. To support the dual processors on my autorouting circuitboard design, and AutoCAD R13 software, I needed NT 4.0. This is the "dream" system talked about in all game magazines, (well, a dual Pentium II might be even better) and to run the high-end games this is what you need.

My problem comes with game manufacturers. You spend thousands of dollars on the best hardware to run the games and get an OS that takes full advantage of the hardware, but the game manufacturers say "most of the gamers have Window 95." The reason Win95 is still out there is because hardware and software providers are too lazy to go to NT 4.0. DirectX used to be a pretty good argument for Win95, but NT 4.0 Service Pack 3 supports DirectX 3.0, so this excuse no longer washes. Since you folks at *boot* have some say in the industry, why not kick some butt and get these people over to NT 4.0? As you can see, I'm sick of it, and I'm not going to take it anymore.

Randy McHugh

You Don't Have a Case

I've been trying to find a good case for my new ATX motherboard, and I've come up with jack. I've been all over the place, and most places online don't have pictures or won't sell just a case. Is there somewhere you can point me to find one?

Ryan Kautzman

HARDWARE REVIEWS EDITOR ANDREW SANCHEZ REPLIES: *Take a peek at Central Computers' web site (www.centralcomputer.com), or give the company a holler at 408.248.5888. Its web site lists all the ATX cases it has in stock.*

Next-Gen MMX

I was browsing through the tracking sheet (*boot* 10), and I came across an item labeled MMX-2. Please don't tell me there is another instruction set supposed to speed up multimedia. Either that, or Intel has gone insane.

Evil Homer

HARDWARE REVIEWS EDITOR ANDREW SANCHEZ REPLIES: *MMX-2 is no lie. Next year, Intel plans to introduce MMX's sequel in the form of MMX-2. Intel's upcoming Katmai processor will be the first to use the new technology, which is designed to greatly improve 3D graphics performance (the original MMX didn't), as well as accelerate 2D graphics manipulation.*

Java Bug

I'm a Java wannabe, so I tried your applet in *boot* 09 ["Grind Your Own Java" feature]. I installed the Java Workshop no problem. I then proceeded to go through the step-by-step instructions very carefully. I used your code from the CD-ROM, your pictures, even your label names. I didn't want to take any chances!

After all was said and done, I got six errors on the build. I figured it was my fault and proceeded to delete all the files JWS created, deleted the project, and did it all again. This time I was doubly careful. Same result: six errors. After much study, many hours, and some luck I found that what is missing is the line: import.Java.applet.*;. I entered it at the top with the other import statements. Now the applet works great! It really displays how well multithreading works in Java. The sounds actually play on top of one another if you move the mouse quickly. I just wanted to write in and tell you about this "bug" in case there are other pathetic wannabes like me trying to make this program work.

Bryan R. Kohn

AUTHOR NEIL REDDING REPLIES: *You're one of those "alert students," eh? You're right, we forgot to add the import statement at the top of GroovyBox.java (it's actually "import java.applet.*;" and must be entered exactly).*

Another thing to check in case things don't build is the case of characters in names you enter. Because Java is case-sensitive, "groovyBox" isn't the same as "GroovyBox," and so on.

Finally, if you enter the code from Step 5 by hand, make sure you add another "}" at the end of the method—ours got lost in the layout. Ouch!!

"What a **shock** to see the photo of a **young girl** in **tears** while making **clip art**."

So, This is How Orson Welles Felt

I just opened *boot* 10. Anticipating the usual goodies that come with each issue, I skimmed the magazine from front to back as I usually do before looking at the *bootDisc*. That is until I got to page 109. What a shock to see the photo of a young girl in tears while making clip art. At first I thought this was some kind of poor joke on the quality of clip art on the market today. Then I thought the page was an informative advertisement (you know, the kind where companies pay for a full page to espouse their opinion on an upcoming House Reform Bill in Congress). But reading on, I was outraged at the sheer number of indentured children.

As a graphic artist and a member of humanity, I find child labor abuse to be a high-priority item to be combated. I want to know more about who to contact to help fight this crime. What were your sources, and how did you get the photo for the article?

As far as I'm concerned I'll use only art that I create or know first hand who the source is. This article should have been on the cover!

Jim Powell
Graphic Artist

EXECUTIVE EDITOR JON PHILLIPS REPLIES: *I've been following the illicit clip art tragedy since 1942, when I was a foreign war correspondent working under Edward R. Murrow. Back then, we mostly saw simple black-and-white line drawings, sometimes a manually applied Benday dot or two, but nothing like the complex and demanding artwork found in today's commercial publishing. I personally shot the photo published in the article—by posing as a little girl.*

Cut, Copy, Paste

Moto Racer GP (review, *boot* 11, page 83) is published by Electronic Arts, not BMG Interactive.

To correct the caption in the Yamaha CDR400tx review (*boot* 11, page 99), *DirectCD* will *not* be part of Windows 98, but it's a damn good idea.

In Pure Lust *boot* 11, the descriptions for the Texas Microsystems Hardbody Handheld PC and the Motorola PageWriter 250 were swapped. Also, the dimensions for the Hardbody PC should be 6.37 x 9 x 2.125 inches.

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DVD Access Time (Less is Better)	200	270
TV Display Feature	Yes	No
X & Y Video Scaling	Yes	No (X only)
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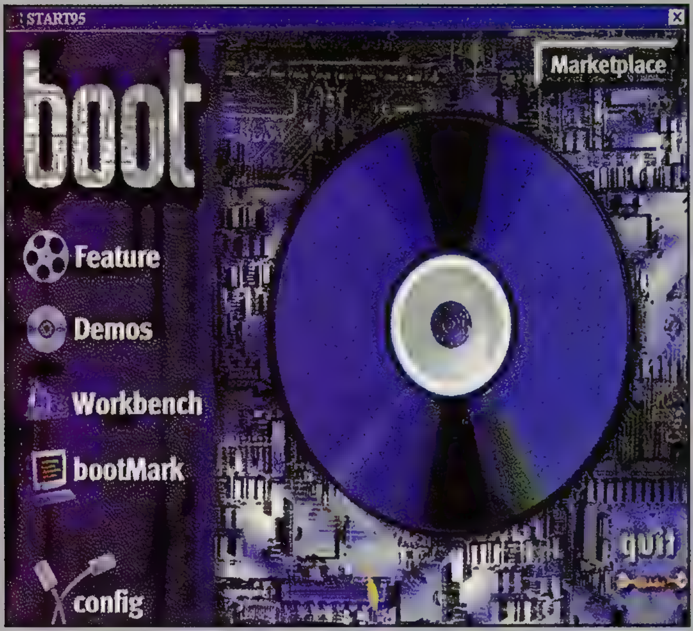
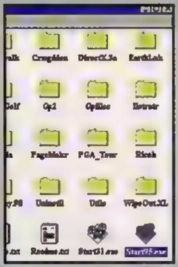
bootDISC

EVERY MONTH, **BOOT** DELIVERS **OVER 600MB** OF THE **HOTTEST** DEMOS AND **COOLEST** APPS

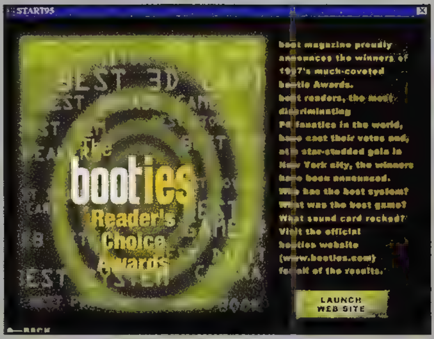


HOW TO RUN THE DISC

From the root of the **bootDisc**, double-click either start31.exe (for Windows 3.x or NT 4.0) or start95.exe (for Windows 95 or NT 3.51).



ON **THIS MONTH'S** DISC:



boot magazine proudly announces the winners of 1997's much-coveted bootie Awards.
boot readers, the most discriminating PC fanatics in the world, have cast their votes and, at a star-studded gala in New York city, the winners have been announced.
Who has the best system? What was the best game? What sound card rocked? Visit the official booties website (www.booties.com) for all of the results.

boot *magazine proudly announces the winners of 1997's much-coveted bootie Awards.* boot *readers, the most discriminating PC fanatics in the world, have cast their votes and, at a star-studded gala in New York City, the winners were announced. Who has the best system? What is the best game? What sound card rocks? Click the button on this month's Feature to go straight to our private booties bash where you can party with the stars.*

CAKEWALK
Pro Audio
VERSION 6.0 VERSION

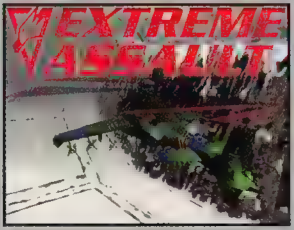
Cakewalk Pro Audio is MIDI and digital-audio software for Windows that lets you record, edit, play back, and print music. New features in version 6.0 include Reverb, Flange, Chorus, EQ, Delay/Echo, Time compression and Expansion, Pitch Shifting and more.

Win95. Requires: 16MB of RAM and 12.5MB of hard-disk space. Fully functional demo with Save and Program Settings disabled; demo also cannot print or perform various other functions. From Cakewalk. **See the review on page 103.**

CARMAGEDDON

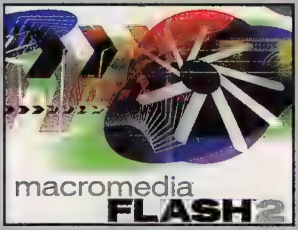
Carmageddon, a 360-degree 3D racing game awards points for speed, style, and mowing down pedestrians. It offers multiple camera angles and multiplayer support.

DOS & Win95. Requires: Pentium 90, 16MB of RAM, and 39MB of hard-disk space. Can only drive the Eagle on one of the tracks with a max of five opponents. Network play and save-game option are disabled. From Interplay. **See the review on page 109.**



Pilot a 21st-century attack helicopter and drive the next-generation battle tank in **Extreme Assault**. Multiple warheads and the ability to destroy anything on the screen are spotlighted in this real-time 3D game which does't require any special cards.

DOS & Win95. Requires: Pentium 90MHz with 16MB of RAM and 40MB of hard-disk space. This demo contains the first half of Operation Area One and Operation Area Two. From Blue Byte. **See the review on page 94.**



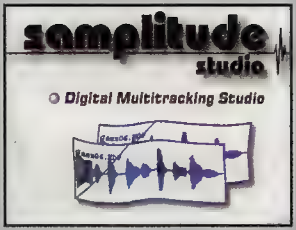
Flash is the midpoint between GIF89a animations and full-blown Shockwave interactivity online with **Flash 2**. It breaks the bandwidth barrier, enabling you to create animations, interfaces, buttons, drawings, cartoons, and more—now with sound!

Win95. Requires: 486 processor or faster with 8MB of RAM and 6MB hard-disk space. This is a fully functional 30-day trial version. From Macromedia. **See the review on page 102.**

PGA TOUR PRO

PGA Tour Pro is the only game with the PGA Tour license. The big feature of this golf sim is Instaview, which allows you to see any part of the course at any time. Also included are photorealistic golf swings, fly-by movies of each hole, and a real-time ball cam. Multiplayer support for up to four people is available in the full retail version.

DOS & Win95. Requires: 486DX/66MHz with 8MB RAM and 30MB of hard-disk space. From Electronic Arts Sports. **See the review on page 107.**



Samplitude Studio 4.0 is professional-grade sound recording/editing software. It offers an unlimited number of tracks, with an unlimited number of record and playback devices offering a flexibility bar none. The new real-time mixer allows real-time control of volume, panning, 3-band parametric EQ, compressor, delay, and two AUX sends per channel/track.

DOS & Win95. Requires: Pentium processor with 16MB of RAM and 5MB of hard-disk space. Features are only limited by the length of a recorded project (approx. 1 min). From SEK'D. **See the review on page 103.**

SHADOW WARRIOR

Shadow Warrior is the latest game based on 3D Realms' BUILD engine, made famous by *Duke Nukem 3D*. With eight-player network and two-player modem multiplayer support, featuring deathmatch and cooperative play (including saving of net games),

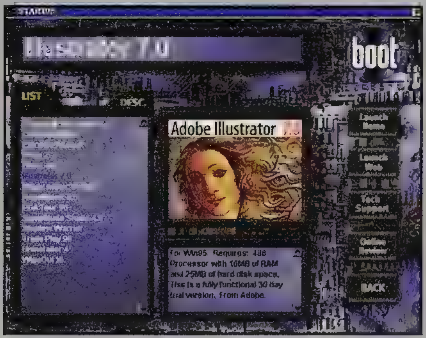
DOS & Win95. Requires: Pentium processor with 16MB of RAM and 28MB of hard-disk space. This demo contains the first eight levels with limited weapons and items. From GT Interactive. **See the review on page 102.**

TRIPLE PLAY 98

Triple Play 98's real-time 3D baseball boasts improved AI, strategy and sports play-by-play calling by Jim Hughson, and color commentary by Buck Martinez. It also offers deeper stats—over 50 tracks—with motion-captured polygon players and more than 5,000 frames of animation.

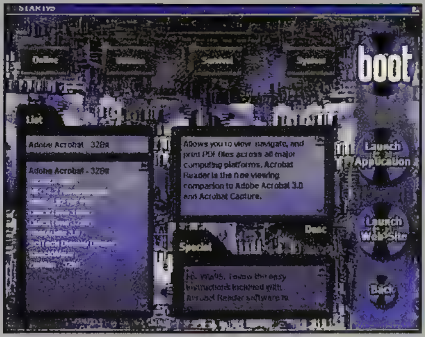
DOS & Win95. Requires: Pentium processor with 16MB of RAM and 11MB of hard-disk space. Demo is of HomeRun Derby which only allows you to hit balls. From Electronic Arts Sports. **See the review on page 104.**

ON THE bootDISC **EVERY MONTH:**



For Win95. Requires: 486 Processor with 16MB of RAM and 25MB of hard disk space. This is a fully functional 30 day trial version. From Adobe.

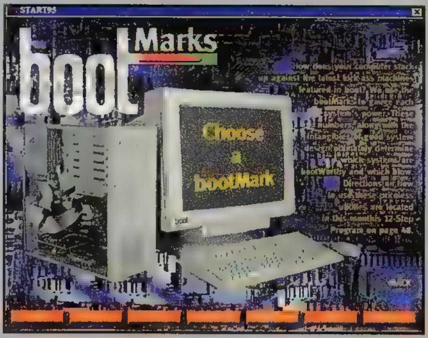
Read the review, then check out the demo. There's no better way to get a feel for an app than firing it up and trying it yourself. We cram as much as we can on the bootDisc *every month. Simply select the demo you want to try and hit the Launch Demo button, or hit the Launch Web button to check out the publisher's web site for more info. Hit the Tech Support button for a phone number you can call with questions/problems, and the Online Review button takes you to directly to the review on the* bootNet, *in case you don't have the mag handy.*



Allows you to view, navigate, and print PDF files across all major computing platforms. Acrobat Reader is the free viewing companion to Adobe Acrobat 3.0 and Acrobat Capture.

For Win95. Follow the easy instructions included with Acrobat Reader software to

The boot *Workbench contains the utilities, plug-ins, drivers, and patches you need to bring your machine up to date and to run the demos on the* bootDisc. *Here you'll find Adobe* Acrobat *for reading PDF files (used with the* PageMaker 6.5 *and* Illustrator 7.0 *demos), and other essential utilities such as DirectX 3.a, SciTech's* Display Doctor, *and Miscrosoft's* Internet Explorer.



How does your computer stack up against the latest kick-ass machines featured in boot? We use the bootMarks to gauge each system's power. These numbers, along with the intangibles of good system design, ultimately determine which systems are bootWorthy and which blow. Directions on how to use these priceless utilities are located in this month's 12-Step Program on page 48.

Included on every bootDisc *are the bootMarks; a suite of applications that comprise the grueling benchmarks we use to gauge system power. No one benchmarking app can fully test a system's performance, so we came up with 10 that do and included as many of them on the* bootDisc *as we could. A few bootMark apps are not included on this disc due to space constraints and licensing issues.*

COMMIT TO ★ EXCELLENCE
FRONT PAGE SPORTS
GOLF

Front Page Sports: Golf features Sierra's TrueSwing technology—pull the mouse backward for the backswing, then push forward for the follow-through. Execute slices, hooks, chips, and straight long depending on the force and angle of your motion.

Win95. Requires: DirectX 3.a, a Pentium 60MHz with 16MB of RAM and 36MB of hard-disk space. In this demo, you're taken to the 6th, 7th, and 8th holes of Pete Dye Golf Club. From Sierra. **See the review on page 107.**

Adobe Illustrator 7.0

Illustrator 7.0 provides the tools to create inspired designs. Apply shapes, curves, effects, textures, grades, fills, and filters to elements, objects, and images. You can create paths, place, trace, mask, and edit or create graphs and freehand drawings. The new Reshape tool lets you modify or set paths while preserving details.

Win95. Requires: 486 Processor with 16MB of RAM and 25MB of hard-disk space. This is a fully functional 30 day trial version. From Adobe. **See the review on page 95.**

MAGIX music studio
your own

Magix Music Studio—a tool for sound editing on your multimedia PC—lets you add effects, speech and songs, integrate MIDI files, and record the new mix to your hard disk. All this is possible on four tracks and in DAT-quality up to 48kHz. Resampling lets you manipulate pitch and speed of the WAV files from the Magix wave-sound-pool CD-ROMs.

Win95. Requires: 486 processor with 16MB of RAM and 10MB of hard-disk space. This is a save-disabled demo. From Magix. **See the review on page 103.**

Adobe PageMaker 6.5
Page

Adobe PageMaker 6.5 software for print and online pages can import, display, and print black-and-white, grayscale, and color images from most drawing, illustration, charting, and image-editing applications. PageMaker has import filters for TIFF files including RGB, CMYK, and CIE Lab TIFF images, Kodak Photo CD images, EPS graphics, GIF files, Scitex CT, and DCS 1.0 and 2.0 files.

Win95. Requires: 486 Processor with 16MB of RAM and 25MB of hard-disk space. This is a fully functional 30-day trial version. From Adobe. **See the review on page 92.**

UnInstaller
CLEANS WINDOWS...
AUTOMATICALLY

Uninstaller 4.5 uninstalls any application—even the ones Windows can't. Identifies duplicate and junk files that can safely be deleted. Moves apps to another folder, drive, or computer—with all links intact. Updates itself with exclusive *Oil Change* technology.

DOS & Win95. Requires: Intel 486 DX or higher with 8MB of RAM and 5MB of hard-disk space. This is a fully functional demo that times out in 14 days. From Cybermedia. **See the review on page 98.**

WipeOut XL, the classic Sony PlayStation game, finally makes it to the PC. You race grav cars at high speed picking up weapons and power-ups to use against your fellow drivers. The full version supports 3Dfx cards.

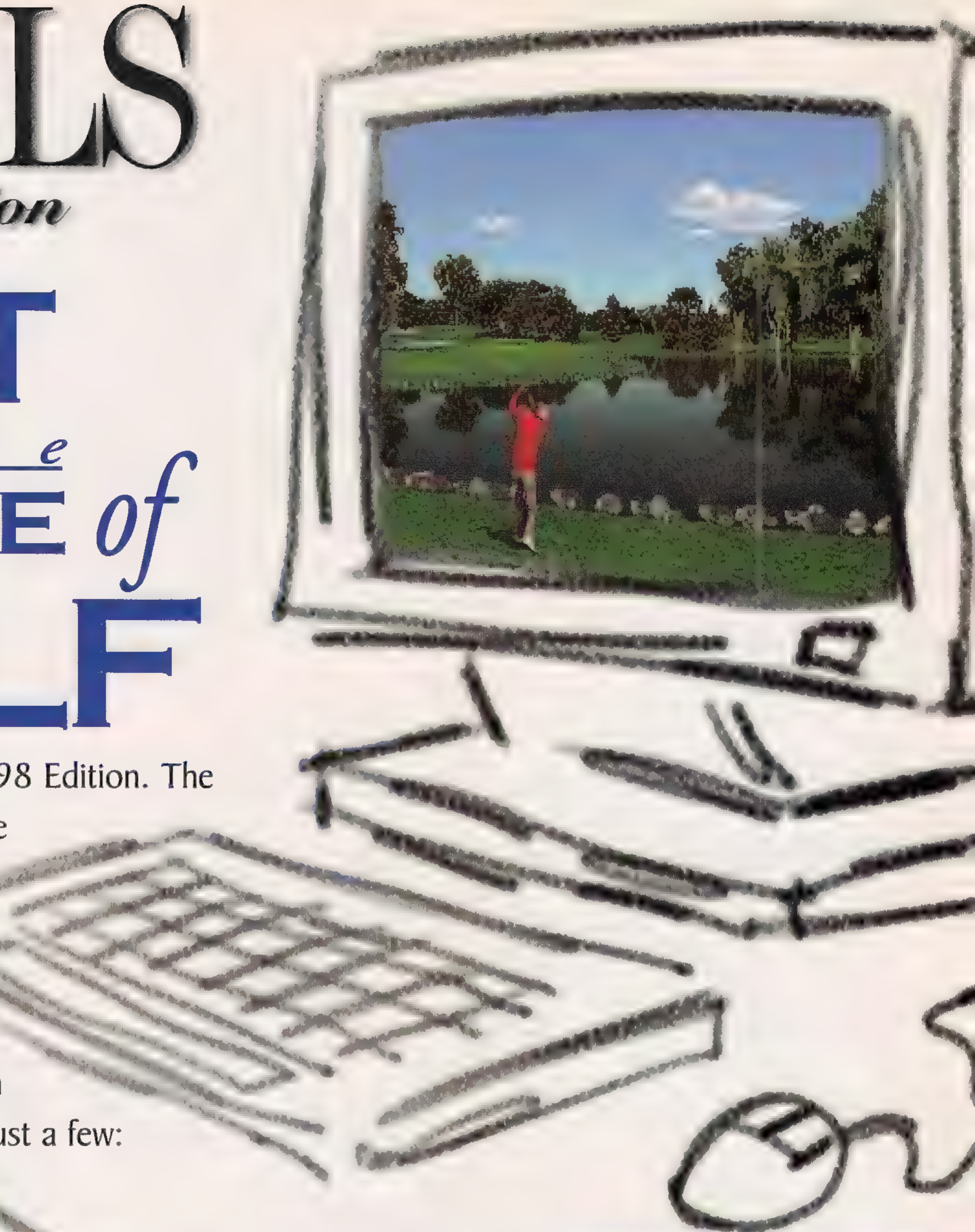
Win95. Requires: DirectX 3.a, Pentium 133 with 16MB of RAM and 24MB of hard-disk space. The demo lets you drive one car and race on one track with limited opponents. From Psygnosis. **See the review on page 110.**

LOOK FOR THE "TRY IT ON THE DISC" **LOGO**

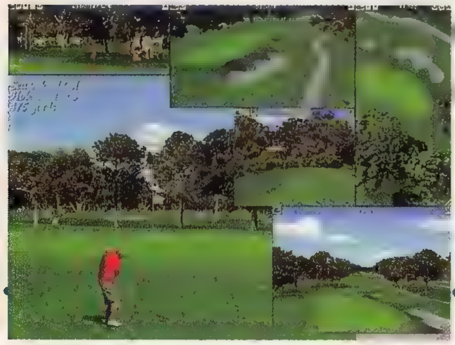
TRY IT ON THE DISC

Links LS
1998 Edition

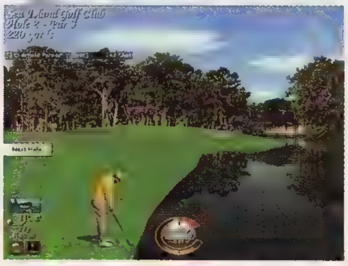
THE ART *and the* SCIENCE *of* GOLF



Introducing the Links LS 1998 Edition. The forces of art and science have combined to produce a golf experience like never before. This new version of the Codie Award winning golf simulation is packed with over 25 new features! Here's just a few:

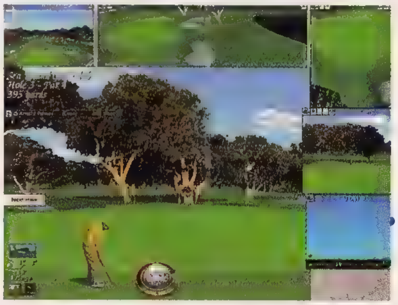


Brace yourself for lightening-fast redraws, main view in a window capability, and up to 8 additional "smart" camera views.



Our course designers have given even more attention to detail including new water reflections, improved textures and enhanced sky backgrounds.

Notice the new waving flags, birds, airplanes and other background animations with up to 8 of your friends over expanded internet play!



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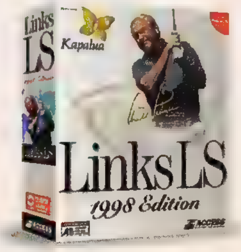

Product Information Number 80

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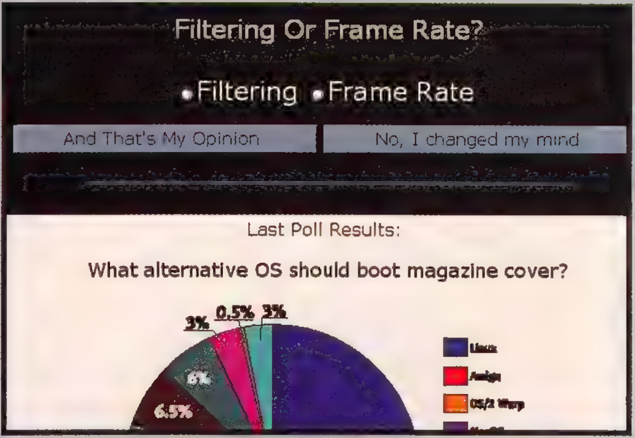
*The quickest way to join the **boot** PC lovefest is to drop by the **bootNet** and **contribute** to our weekly **opinion polls**. Your **feedback** helps us refine the **boot** mission, and sends a direct message to the **industry leaders** who are forging the **PC world of tomorrow**. Cast your **vote**, then overclock your brain with the **results** from last week's poll.*



Filtering Or Frame Rate?

● Filtering ● Frame Rate

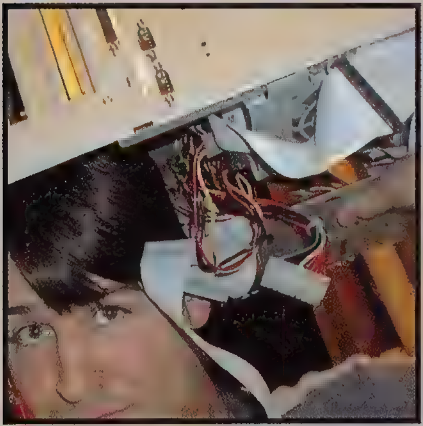
And That's My Opinion

No, I changed my mind

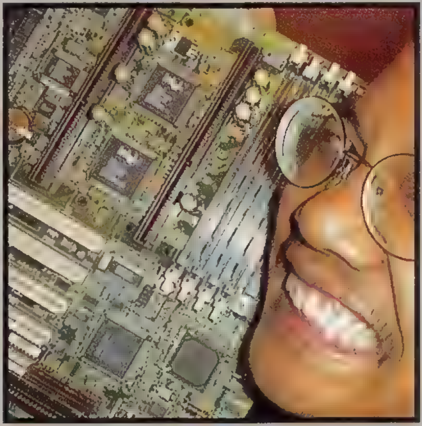
Last Poll Results:

What alternative OS should boot magazine cover?

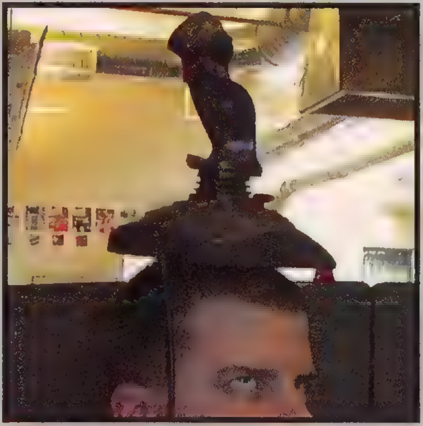
OTHER PRESSING **BOOTLAB** QUESTIONS OF THE DAY…



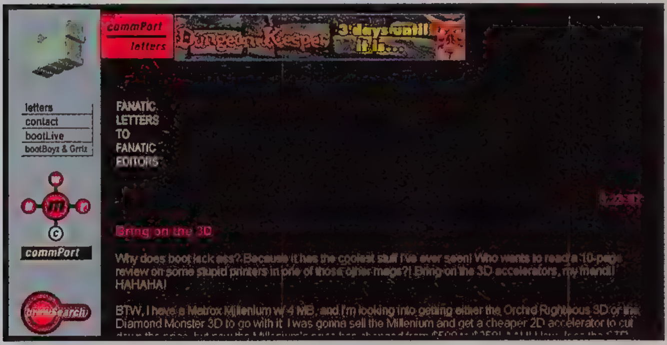
? Should technical editor Chris Dunphy **yank out** the **video card** currently installed in his **testing station**, and insert a half-ripened avocado (a.k.a. Head o' Dunphy)? Tell us at the **bootNet**!



? Should hardware editor Andrew Sanchez **overclock** his 233MHz Pentium II with the help of two **safety pins** and a **caulking gun**? Tell us at the **bootNet**!



? Should news editor Bryan Del Rizzo test **game controllers** by seeing how long they **survive** the rigors of the **dreaded** Canadian Anti-Gravity Field? Tell us at the **bootNet**!

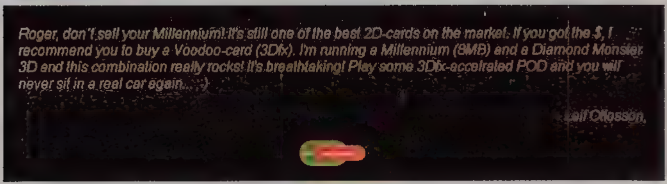


FANATIC LETTERS TO FANATIC EDITORS

Bring on the 3D

Why does boot kick ass? Because it has the coolest stuff I've ever seen! Who wants to read a 10-page review on some stupid printers in one of those other mags?! Bring on the 3D accelerators, my friend! HAHAHA!

BTW, I have a Matrox Millenium w/ 4 MB, and I'm looking into getting either the Orchid Righteous 3D or the Diamond Monster 3D to go with it. I was gonna sell the Millenium and get a cheaper 2D accelerator to cut



Roger, don't sell your Millennium! It's still one of the best 2D-cards on the market. If you got the $, I recommend you to buy a Voodoo-card (3Dfx). I'm running a Millennium (8MB) and a Diamond Monster 3D and this combination really rocks! It's breathtaking! Play some 3Dfx-accelrated POD and you will never sit in a real car again... ;-)

Leif Olsson,

*Tell us **all** your thoughts at the **bootNet**. Go straight to **Comm Port** to read, send, and respond to letters to the editor. **boot** readers are the most voracious, tenacious, hellacious readers in the PC universe, and your **feedback** is as much a part of **boot** as any column, review, or how-to.*

? Should someone volunteer to **clean** Andrew's section of the **bootLab**, and **unearth** the precious **SEC** that fell behind the bootBench? Tell at the **bootNet**!

ADD TO A THREAD **TODAY.**

INTERNET GAMING
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lock. Then it's bye-bye until tomorrow. When I crush them in my monster truck.

PEOPLE PLAYING PEOPLE PLAYING PEOPLE

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PEOPLE PLAYING PEOPLE PLAYING PEOPLE

X-WING® VS. TIE FIGHTER®

Monster Truck Madness™

I play:

NE.com

Backgammon

Outlaws™

I go to see my friends. In the targeting sight. I see them long enough to get a blasts like spit because I like to go all out on everything. Except my wallet.

INTERNET GAMING ZONE

WHERE DO YOU WANT TO GO TODAY?™

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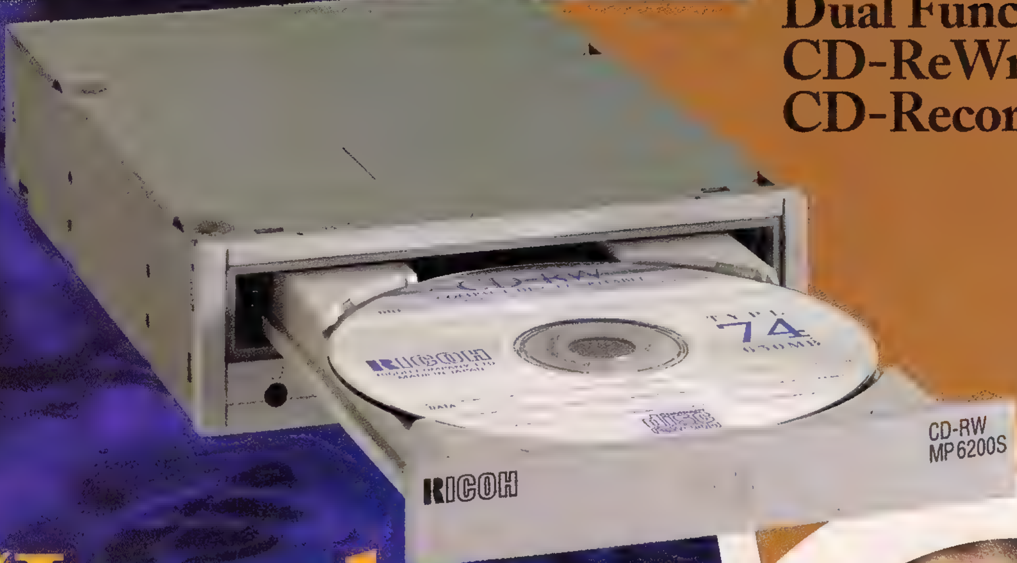

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"Now my creativity doesn't suffer the limitations of 'insufficient disk space.' I can store and update my monster files as often as I want and read them on other compatible CD drives."

Jamie
Graphic Designer

Backup/Archiving

"CD-RW, the ultimate backup solution, lets me span multiple CDs for unlimited storage. I can store up to 1.3GB per disc for less than 2¢ per MB with the reliability of optical media."

Randy
MIS Manager

Home Use

"It's cool. I can save and update all my pictures, browse my favorite websites off-line, whatever I want."

Brad
Web Master

Music/Video

"Music's my life. CD-RW lets me tweak and change my audio and video tracks on the same disc until it's just the way I want it."

Kim
Musician

Authoring

"Producing multimedia and interactive CDs requires two things...storage and testing. With CD-ReWritable media, I can affordably test my work to perfection and then master it to a CD-Recordable disc."

Janet
Production Engineer

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Product Information Number 291

Intel **Slashes** Pentium **Prices** Dramatically

$138 MMX Pentiums have both AMD and Cyrix scrambling to find a niche

In the wake of Cyrix's 6x86MX CPU launch and AMD's initial successes with K6, Intel has announced price reductions across the entire MMX line of Pentium processors except the Pentium II. On August 1, Intel will reduce the price of the P233 MMX chip from $594 to $367 in quantity, instead of $436. The P200 MMX will drop to $240, and the P166 MMX will dive to $138. Price cuts on non-MMX Pentium processors are also planned, with P200s going for $119 in bulk.

~~$594.00~~
NOW ONLY
$367.00

While this should ultimately lead to lower prices for consumers, Intel's strategy clearly—and dramatically—redefines the Socket 7 landscape. AMD and Cyrix position their CPUs as inexpensive Pentium killers—low cost being the sole motivator for many OEM—but Intel's surprise announcement forces both companies to undercut Intel's new prices if they wish to remain competitive.

Considering that the performance of AMD and Cyrix chips don't match Intel offerings across the board, these alternatives lost a serious negotiating advantage in their bid to be your next CPU. AMD's K6 challenges Intel's comparable offerings and the Cyrix 6x86 isn't even close. (See page 44 of the "Pentium Killers" feature in this issue for our review.)

When the news broke of Intel's lowered prices, Cyrix was selling its 6x86MX-PR200 (which runs at 166MHz) for $240—on par with Intel's lowered price. Even though AMD claims it is setting its sights on the Pentium II, not the Pentium MMX (although performance is more on par with the latter), AMD found itself priced $100 higher than the Intel equivalent.

> "Intel's current price **reductions** are a **clear** indication that the processor **environment** is a lot **more** competitive than they **expected."**
>
> *— Paul Pascarelli, Cyrix*

Both Cyrix and AMD were expected to quickly announce their respective price adjustments. At press time, however, only AMD was willing to follow suit.

At PC Expo (where Intel was busy showcasing its $1,900 Pentium II 300MHz processor and Tillamook 233MHz mobile processor), AMD's Dean Whitehair told *boot* that "K6 competes in price and performance with the Pentium II, and thus, the current Pentium-MMX price drops will have no immediate effect on AMD's pricing plans." However, Whitehair also said that it is AMD's policy to be "at least 25 percent less than the comparable Intel offering."

Regardless, a few days after the show, AMD countered Intel's new pricing, announcing official price reductions of the K6-200 to $180 in quantities of 1,000—a full 25 percent less than Intel's P200 MMX. At press time, Intel hadn't yet announced price reductions for the Pentium II.

Meanwhile, Cyrix continues to fight with the one-two punch of its MediaGX and MMX-enhanced 6x86MX processors, despite the fact they haven't landed any top-rank OEMs.

"Intel's current price reductions are a clear indication that the processor environment is a lot more competitive than they expected," said Paul Pascarelli, Cyrix's marketing manager. "However, we will strive to maintain a price point at approximately 50 percent below pricing set by Intel."

Whether this twosome can survive with reduced profits remains to be seen. Both AMD and Cyrix are proceeding with plans to introduce faster processors later this year. Cyrix plans to release a 266MHz part by Q3 and a 0.25-micron 300MHz part by year's end. AMD also plans to release a 0.25-micron 300MHz part by year's end, as well as an AGP-compliant 650AGP PCIset. **b**

NUGGETS

DirectX Inventor Fired by Microsoft

Microsoft has fired Alex St. John, the architect of DirectX and their gaming messiah. The bombastic St. John was profiled in an extensive two-part Lip interview (*boot* 04 and 05) which is now available online in the "You Asked For It" section of the *bootNet* site.

As expected, Microsoft press folks are tight-lipped about the sudden departure of the key figure behind its DirectX technology. However, during a short interview, St. John told *boot* he was escorted out of the building after making comments about Direct3D and certain 3D video cards–offending Microsoft executives, who engineered his dismissal.

14-inch Screens on Notebooks by Year's End

Further closing the performance gap between notebooks and their desktop kin, many manufacturers, including NEC, Gateway 2000, Hewlett-Packard, IBM, and Toshiba, are preparing to offer notebook PCs with 14-inch screens by year's end. These screens' display area will equal that of a 15-inch CRT monitor.

Toshiba, which offered the first of the short-lived 13.3-inch models, is expected to produce the first 14.2-inch notebooks due to its partnership, along with IBM, in Display Technology, one of the world's largest LCD fabs. Prototypes

> 20

shown at the Computex trade show in Taiwan packed mondo power, including DVD swappable with 20x CD-ROM, USB ports, MPEG-2 support, CardBus, and high-speed IRda, in an A4 formfactor weighing less than 8 pounds.

The availability of 14-inch screens depends on getting motherglass yields up, and even when that happens the larger screens are anticipated to command a $500 premium over current 13.3-inch offerings.

56.6 Speed Limit Increased to 67.2Kbps

Transend announced the fastest modem operating on traditional analog phone lines to date. The Sixty-Seven operates at–surprise!–67.2Kbps and requires two phone lines to accomplish the feat. It also requires that the receiving end be running a Transend Sixty-Seven; otherwise, throughput drops to a merely mortal 33.6.

The $600 external modem (an internal version with a $450 price tag is expected in the fourth quarter) delivers one-channel ISDN performance without all the hassles and expenses traditionally associated with the digital option.

Move Over Pentium II: Slot 2 and 450BX Are Waiting in the Wings

Just when you thought it was safe to buy a Pentium II-based system, Intel unveiled its future multiprocessor interface to select vendors. Dubbed Slot 2, this larger version of Intel's new CPU interface is designed to handle the next generation of SEC cartridge processor, which will use faster L2 cache architecture and house two processors within one cartridge, giving you up to four processors for serious horsepower. With current Pentium II architecture maxing out at two processors (due to space constraints on the motherboard and PCIset considerations), Slot 2 will give power users and servers what they crave. But multiple processors are useless without the proper PCIset, so Intel plans to introduce its 450BX quad-processor-compatible PCIset alongside Slot 2. And no: Slot 2 is not compatible with Slot 1.

Expect both technologies to hit the streets as early as 1998.

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The **Shape** of **Things** to **Come**

boot gets the scoop from the floor of PC Expo in NYC

LIVE BROADC
PLAY

Kiki Stockhammer wows the crowd with Trinity video editing system.

The most welcome, if not surprising, change seen at this year's PC Expo was that most of the top-tier system manufacturers are finally ditching S3's ViRGE in favor of more robust video solutions. Unfortunately, manufacturers forced us to sign NDAs, so we can't name names–however, one video chip in particular seems poised to become all the rage this fall.

As for motherboards, many manufacturers have finally adopted the ATX formfactor, tossing aside the cramped LPX formfactor. New 266MHz and 300MHz Pentium II desktop systems were also on display, with modular cases packing geek ports and removable-media bays, multimedia keyboards with built-in CD-ROM controls, and a bevy of one-touch programmable buttons. Aesthetics aside, it will be interesting to see how these new systems actually perform.

GA-GA OVER GIGS

Curiously, many major hard drive manufacturers were absent from the show floor. Seagate, Micropolis, and Quantum were no-shows, though Fujitsu and Samsung were pimping new drives with faster transfer rates and more gigs to the ounce. Fujitsu, for example, is releasing five new EIDE hard drives ranging from 1.75GB to 5.25GB with prices from $239 to $449. As a bonus, most major systems manufacturers are planning to boost the storage in new systems—even promising units upward of 8GB.

DISPLAYS ON DISPLAY

The LCD panel—the bastard son of the CRT—appeared ready for prime time, with ViewSonic, Portrait, and Samsung demonstrating flat-panel technologies ranging in size from 14 inches to 40 inches and beyond. Sony even had a mysterious 50-inch LCD wide-screen rear-projection monitor on the show floor, although the company refused to disclose any technical specs or availability information.

The **Play** of **Things** to **Come**

E3 '97 was hot and hotter

At this year's E3 show in Atlanta, the only things hotter than the summer nights were the excellent new games and gear we have to look forward to. ***boot*** *beat the floor to uncover the absolute hottest the industry has to offer.*

3D EVERYWHERE

The 3Dfx Voodoo was the accelerator of choice in nearly every booth and has emerged as the baseline standard. The biggest 3D surprise is Oak Technologies' new Mach5 3D chip, delivering scene anti-aliasing in a consumer-priced chip for the first time.

MULTIPLAYER

The only rival to the show-floor domination of 3D acceleration was multiplayer gaming. Every game in the works seems to have Internet play. The long-awaited *Ultima Online* has finally gone into public beta. Microsoft announced two pay-as-you-play massively multiplayer games: *Fighter Ace* and *Asheron's Call*. SegaSoft's *10 to the Sixth* will be the first game to support 1 million simultaneous players. If someone attacks while you're offline, the game can call your pager and warn you to log on and defend yourself. (And we thought Tamagotch's incessant beeping was annoying.)

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STATE OF THE SILVER DISC

Judging from the bootleg *Batman and Robin* DVD movies being hawked in Times Square to the show-floor buzz surrounding new optical drives, it's clear both CD-ROM and DVD-ROM technologies are alive and spinning.

Major systems manufacturers—including NEC, Hewlett-Packard, Micron, Gateway 2000, and IBM—announced they will ship DVD-ROM drives and MPEG-2 decoder cards with systems early this fall (either as part of a standard offering or as optional upgrades). While Panasonic and Toshiba showcased current DVD-ROM drives, Samsung stole the show by unveiling its SDR-130 EIDE DVD-ROM drive. Conquering the CD-R incompatibility issue by using a proprietary single-lens/dual-laser system called Annular Mask Pick Up, the SDR-130 sports a 512K buffer and data transfer rates of up to 1350K/sec. Toshiba, meanwhile, plans to unleash CD-R-compatible drives by late Q3 of this year.

New **266MHz** and **300MHz** Pentium II desktop **systems** were also on **display**, with **modular** cases packing **geek ports** and **removable-media** bays, **multimedia** keyboards with built-in **CD-ROM** controls, and a bevy of **one-touch** programmable **buttons**.

With most manufacturers predicting that DVD-RAM drives will ship before Q2 1998, Hitachi shocked attendees by promising mass-produced DVD-RAM drives by the end of this year. Although the ink on the 2.6GB/side DVD-RAM standard is hardly dry, Hitachi claims it will be able to fulfill volume orders this fall. A company spokesman said the company hopes DVD-RAM can be a viable alternative to floppy drives in new systems within five years. Hitachi announced two internal DVD-RAM drives—an IDE/ATAPI model, the GF-1000, and the SCSI-2 GF-1050, each listing for $794. An external SCSI-2 portable drive—the GF-1055—will be available for $953. All drives will feature a dual-laser head, and be compatible with CD-R media.

Even the mobile arena was abuzz with DVD, with notebook manufacturer Twinhead promising a half-height DVD drive/MPEG-2 decoder/LS120/ZIP combo in a swappable drive format by November.

As for CD-ROM, don't count it out just yet. Using partial CAV technology, Toshiba had its $189 XM-6102B 12x-to-24x EIDE CD-ROM drive up and running. Samsung displayed its $129 24x CD-ROM drive as well. Still, many manufacturers are setting their sights on the 32x mark. But when asked about the possibility of 44x drives, Toshiba product manager Sean Stead told *boot* "by that time, second- and third-generation DVD-ROM drives should have surpassed the 51 percent mark in market share, and interest in the 640MB silver disc will begin to seriously wane." Look for mobile 20x drives shortly.

Cyrix's booth was abuzz with 6x86MX madness.

Hitachi showed one of the first double-speed DVD-ROM drives, the $750 GD-2000, expected this fall. Reading both CD-ROM and CD-R media at a 20X CAV maximum speed, the GD-200 can also transfer data from DVD discs at 2.76MB/sec.

LAST BUT NOT LEAST

Finally, Play Inc.'s Trinity is a $5,000 PC-compatible video-editing solution combining a live D1 production switcher, 3D digital video effects, virtual sets, and a matte generator in a single, expandable case. Produce all the programming for your very own cable-access channel with digital ease. As for us, we'll probably produce the much-anticipated pilot for *bootTV*. Trinity is expected late this summer.

QUAKERS

Everyone wants to be *the* "*Quake* killer," but the successor may turn out to be *Quake 2*. With real-time lighting effects and more of Carmack's magic, *Quake 2* looks tough to beat. Epic Megagames plans to try with *Unreal*, slated for an October debut. *Trespasser*, from DreamWorks, also looks amazing. This digital sequel to the *Lost World* movie promises to deliver the most realistic game physics model ever. *Jedi Knight* from LucasArts also looks promising, as does 3D Realms' *Prey*. If you'd rather have a third-person perspective, look for Lara Croft in the even more well-rounded *Tomb Raider II* from Eidos, featuring higher polygon counts and enhanced scenery.

You'll feel the force with the force-feedback that supports Jedi Knight.

REAL-TIMERS

The big development in real-time strategy games is the introduction of 3D terrain. The niftiest is *Plague*, a medieval combat game from Eidos that combines management and fortress building with extensive siege warfare and economics. *Total Annihilation* from Cave Dog also has gorgeous terrain. And for the ultimate real-time strategy experience, relive the Civil War in Sid Meier's *Gettysburg*.

FLY ON

Microsoft's *Flight Sim 98* supports 3D acceleration and great force-feedback effects, while Sierra's *Pro Pilot* offers realistic terrain and tower interactions across the nation. Looking Glass' *Flight Unlimited II* has more of everything, but only in the San Francisco Bay area. If you'd rather fly with a trigger on your stick, the hottest military flight sims are *EF 2000 v2.0* and an *F-22* game from DID—both look stunning. For off-world flight Bethesda has *10th Planet* and Origin was showing off *Wing Commander: Prophecy*.

If wings aren't your thing, Psygnosis' futuristic helicopter shooter, *G-Police*, has stunning lighting effects. And for tunnel flying, Acclaim's *Forsaken* is the ultimate "*Descent*-killer" and one of the most impressive uses of 3D hardware we saw at the show.

Sid Meier's Gettysburg.

56.6Kbps: Time to Choose Sides

Competing standards make your decision hard

As Study Group 16 of the International Telecommunications Union soberly works on a 56.6Kbps modem standard, hardware manufacturers are waging war over specs. Sales and mindshare hang in the balance until January 1998, when the ITU plans to announce a standard, and modem manufacturers unite under a single spec.

In one corner sits U.S. Robotics, proprietor of x2, which is also licensed to Cardinal Technologies. In the opposite corner sit Diamond, Motorola, Hayes, and a slew of smaller companies who embrace K56flex, a spec that's co-developed by Rockwell and Lucent.

USR began shipping x2 modems in February, two months before K56flex hit the shelves. At the time, the K56flex camp accused USR of failing to point out that FCC regulations limit x2 to 53Kbps, and that most users will only achieve top speeds in the mid-40s due to line conditions (a reality for both x2 and K56flex users).

When K56flex launched, USR pointed to the 2,382 POPs already supporting x2 and the relatively few 500 POPs that supported K56flex, none of which belonged to major ISPs. The unkindest blow came May 28, just two days before K56flex's coming-out party. USR announced it would provide free upgrades—software or hardware—once the ITU finalized its 56Kbps spec.

USR now had a two-month head start and dominant ISP support, plus their promise that consumers could buy x2 without worrying about upgrade ramifications. Since x2 and K56flex offer essentially the same 50Kbps peak throughput, the big issue became guaranteed upgrades. As of mid-June, Motorola was the only K56flex manufacturer to guarantee unconditional upgrades.

All modem manufacturers *boot* has interviewed since February agree there's only a 1 in 10 chance a hardware upgrade will be required. "My suspicion is it will be a software upgrade," concurs Les Brown of Motorola's Research and Advanced Development group and rapporteur for the ITU's Study Group 16. "I don't think we'll be proposing a standard much different from the solutions companies are offering."

Still, most K56flex companies are avoiding broad promises. "You're seeing vendors being a little bit irresponsible," comments Michael Reed, Diamond's communications division product manager. He describes an ugly scenario in which millions of modems must be promptly swapped out, a maneuver that could bankrupt a company and destroy reputations.

Diamond says its modems are built from the ground up to get the most from the K56flex protocol

"There aren't many modem companies that have a year's worth of cash to weather that storm," Reed continues. "If you go out of business, you're not delivering to the customer, and if you take a year to deliver a hardware swap—which is not trivial—then you're not delivering either."

Motorola product manager Remi Rieger stands by the unconditional upgrade. "We're a $27 billion company," he says. "That's a lot of resources behind us if we need to do a hardware upgrade." Dean Brady, a USR x2 product manager, is also confident. "We're a very large company," he says. "If it's a hardware upgrade, we're ready to take that hit."

The bottom line is simple: the speed increase is tangible and worth the money. If you're getting speeds in the 30s via your 33.6Kbps modem, you'll probably get low 50s with either x2 or K56flex. When it's time to choose sides, go with the spec supported by your favorite ISP and buy from a stable manufacturer with the best price, bundle, and upgrade plan. b

NUGGETS

3D Card Casualties Mount

Electronics giant Rockwell Semiconductor announced it will stop all development of the MediaStream graphics processor, which it acquired when the company bought graphics specialist Brooktree last year. Although the chip never even made it to a reference board, the MediaStream showed promise by also offering onboard audio decoding. With the 3D accelerator market becoming fiercely competitive, Rockwell vice president A.C. D'Augustine shrugged off the project, stating, "Our position wasn't super strong in graphics anyway."

Another potential player, S-MOS Systems, is also undergoing a shakeup. S-MOS had teamed with RSSI to bring its innovative PIX and TEX 3D architectures to market, but found it difficult to fabricate the complex chips RSSI demanded. Rather than call it quits entirely, RSSI has split from S-MOS and is hoping to go it alone, contracting its fabrication work to more capable chip foundries.

When 8 Million Just Isn't Enough

America Online
We Are Ready For You!
We're Increasing The Size Of Our Network By 75%!

America Online, besieged by a host of problems this year—including system shutdowns, e-mail blackouts, and general consumer disdain—has announced its plan to bring on an additional 2 million subscribers by year's end, now that a $350 million technical retrofit has been completed.

AOL drastically cut back its print, television, and radio campaigns earlier this year, but the company is expected to start a new advertising campaign to lure more customers. Be on the lookout for those pesky AOL disks once again, especially since they'll undoubtedly become attached to every magazine, book, and new car sold throughout the end of this century. AOL users might want to snag at least one of those disks, however: They may include an updated version of the AOL software, code named Casablanca, due out in late October.

You were expecting a new version.
But you weren't expecting this.
www.microsoft.com/ie4/preview/

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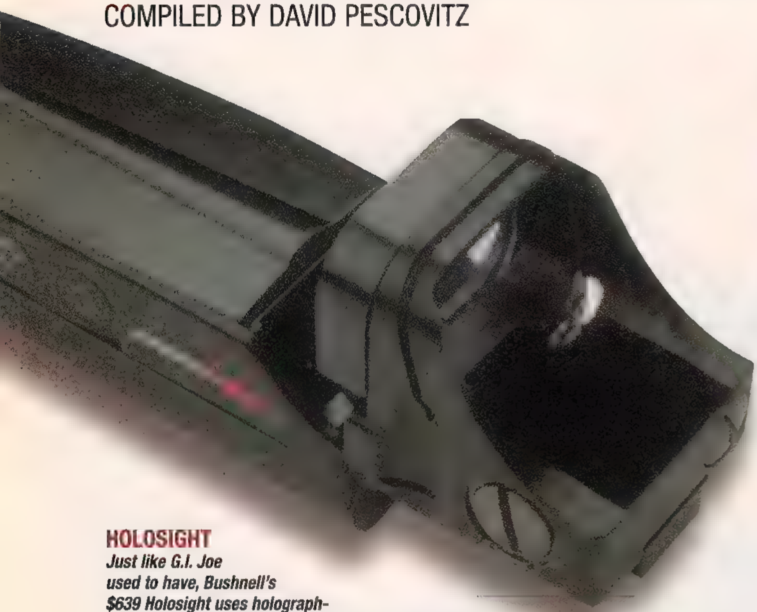
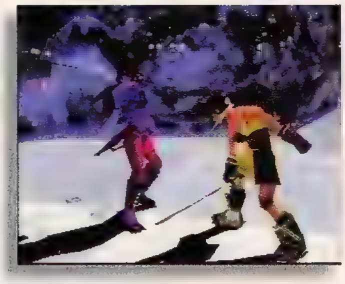




BUSHIDO BLADE

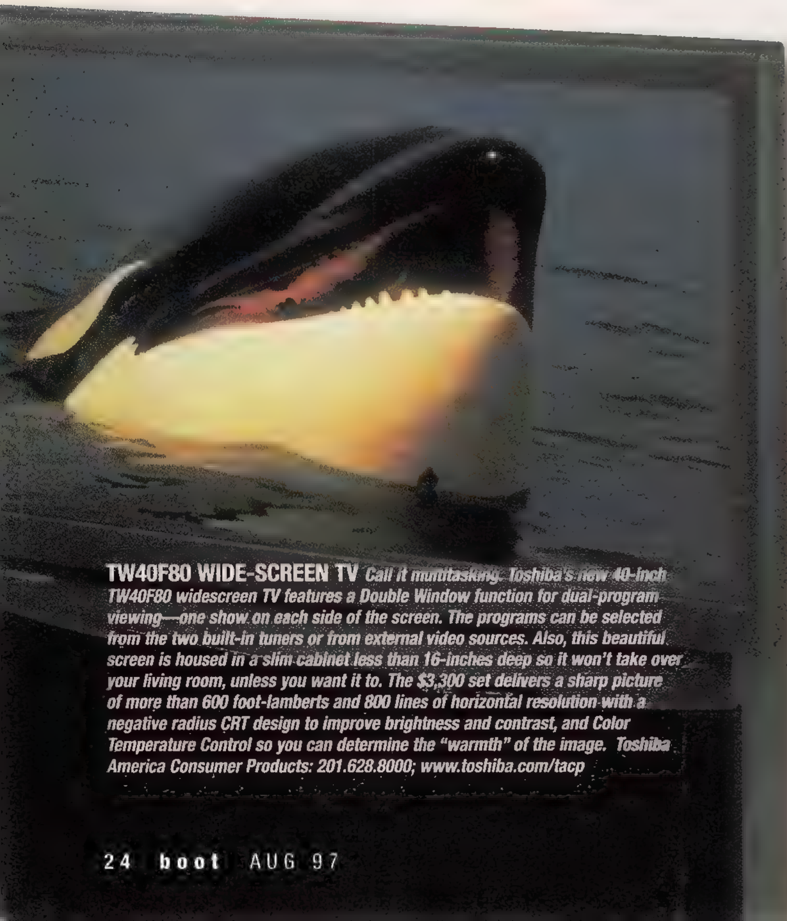
Squaresoft's Bushido Blade cuts through all comers with an awesome mix of deadly reality and unlimited possibilities. While other PlayStation fighting games beat your fighters down with inhuman amounts of damage, a single, well-timed slash of a katana in Bushido Blade will slay your Samurai. This will repulse combo-manic Street Fighter fans, but it makes for some spectacularly realistic weapon-based combat with carefully timed thrusts and parries. Specific body damage infliction results in slashed legs and limping warriors. Slice through an arm, and it loses function.

It's a fight to the bloody finish as you jump down bridges, clash swords in river streams, and run among green bamboo shoots in a fully realized 3D world filled with texture-mapped polygons and smooth frame rates. A cinematic storyline and multiple weapons make for boundless replayability. Bushido Blade is available in Japan and will eventually make its way stateside. Fighting games don't get more realistic than this! Squaresoft: www.sqla.com

HOLOSIGHT

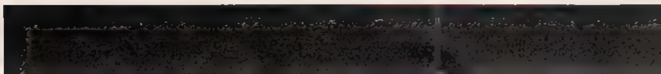
Just like G.I. Joe used to have, Bushnell's $639 Holosight uses holographic technology to bring the heads-up display feel of an F-14 Tomcat to your handgun or rifle. When illuminated by laser light, a reticle image appears on the target plane in focus. A bull's eye is just a matter of placing the bright red reticle image on the target and shooting. The dovetail mounting arrangement of the 246 g waterproof and fog-proof site is adaptable to almost any gun and fits any standard Weaver-style base. Two type N 1.5V batteries are included along with one standard reticle. Other reticles, including a rising tracer dot, dual rings, diamond, and open crosshairs, are available for $137 each. Bushnell: 800.423.3537; www.bushnell.com

SWINGMATE *From radar-detector impresarios Bel-Tronics comes the SwingMate, a device based on fuzz-buster technology but applied to the driving range. Put SwingMate three feet behind the tee-off position, swing, and SwingMate measures your clubhead speed and provides the distance your ball should travel based on how fast you swing. The more you practice, the easier it is to consistently repeat your ideal swing. The $100 SwingMate also suggests the appropriate club to use based on a specified distance. Watch out Tiger Woods. Bel-Tronics: 800.341.1401*



TW40F80 WIDE-SCREEN TV *Call it multitasking. Toshiba's new 40-inch TW40F80 widescreen TV features a Double Window function for dual-program viewing—one show on each side of the screen. The programs can be selected from the two built-in tuners or from external video sources. Also, this beautiful screen is housed in a slim cabinet less than 16-inches deep so it won't take over your living room, unless you want it to. The $3,300 set delivers a sharp picture of more than 600 foot-lamberts and 800 lines of horizontal resolution with a negative radius CRT design to improve brightness and contrast, and Color Temperature Control so you can determine the "warmth" of the image. Toshiba America Consumer Products: 201.628.8000; www.toshiba.com/tacp*

AUTO TASER *You've seen the Air Taser in Pure Lust (boot 05). Now here's the Auto Taser. The metal pole is locked on a steering wheel and armed with a remote control. If a baddie tries to enter your ride, the Auto Taser's motion detectors sense it and activate a screeching alarm. Not enough to deter most thieves, right? Moments after the warning sounds, the Auto Taser is surrounded by a 5,900-milliwatt electron pulse to zap the intruder. That's not enough power to kill, but more than enough to strongly discourage the thief from messing with your ride. Rubber and leather gloves don't provide protection either. Powered by three 9V alkaline batteries, the $200 Auto Taser will keep grabbing hands off your goods. Air Taser: 602.991.0797*



PURE LUST

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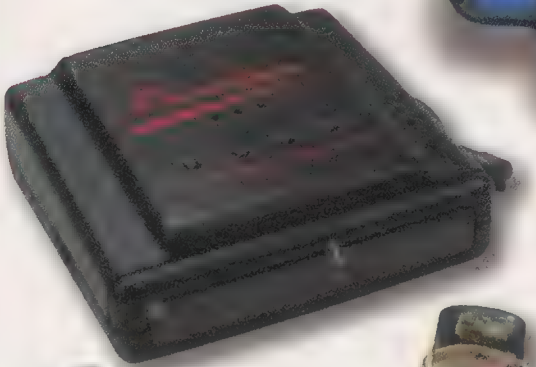
SONY
WALKMAN

WALKMAN WM-EX5 *In honor of their 50th Anniversary, Sony kicks out the Walkman WM-EX5 stereo cassette player. The sleek mirror-finish cassette-size casing makes this Walkman a design tour de force. With 62-hour playback from the internal rechargeable battery and one AA battery, you'll never be without your Mega Bass. The 36x fast forward/rewind speed enables you to hear where you're heading on a tape, so finding that awesome drum fill is simple. Sony's AMS (Automatic Music Sensor) technology skips around the tape to locate and play up to nine songs. Auto reverse, the Automatic Volume Limiter System, Auto Shut-Off, and Dolby B Noise Reduction round out the $300 WM-EX5, which weighs just 6 ounces with batteries. Happy anniversary, indeed!* Sony Electronics: 800.222.7669; www.sony.com

COCOA FROSTED FLAKES *OK, so they may not be high tech, but Kellogg's Cocoa Frosted Flakes are the latest breakfast taste sensation. Combining the goodness of golden flakes of corn (what did you think they were made of?), a trace of soybean, and a delicious chocolate-frosted coating, Cocoa Frosted Flakes are the ultimate part of a complete breakfast. They're also fat free, cholesterol free, and fortified with 10 essential vitamins and minerals. Best of all, these Tony the Tiger-approved flakes turn an ordinary bowl of milk into a mouth-watering chocolate concoction.* Kellogg's: 800.962.1718; www.kelloggs.com



PHANTOM *Radar detection just isn't enough anymore. Those who choose to travel in the fast lane should be equipped with a laser scrambler, such as the one in Rocky Mountain Radar's Phantom. The company is so confident about its $350 box that it will cover the fine if you get a speeding ticket within a year of purchase (some restrictions apply, of course). The Phantom disables Radar and Lidar guns from as far as three miles away to 50 to 200 feet from the speed trap. According to the company, "Radar scramblers work by mixing a portion of the radar signal with background clutter, than reflecting it back to the squad car with a special antenna," confusing the radar gun's computer. Sound illegal? Only if you live in OK, MN, and Washington, D.C.* Rocky Mountain Radar: 915.587.0307

LUNAR GUN WITH RED SIGHT *Sofa-bound Bruce Willis-wannabes rejoice! The shooting segment of Die Hard Trilogy on the PSX, a hollow experience with stock game pads, has a whole new look and feel when you're packin' Naki's $30 Lunar Gun with optional Red Sight. The light-gun controller features auto-reload, auto-fire, and semi-auto-fire, which pops off three shells per squeeze. A Special button, activated by your thumb, triggers bombs and special weapons. The only thing the gun doesn't do is auto-aim, but don't worry, with the barrel-mounted laser sighting, you'll never miss your mark again. Waste international terrorists with pinpoint precision, toast the roaches in your kitchen, or blind the cat with the $17 optional Red Sight attachment.* Naki: 800.626.6254

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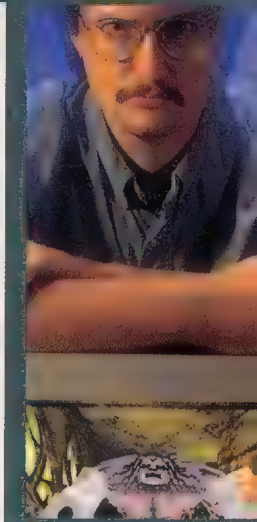
HEROES, HARDCORE GAMERS, THE LONELY, AND THE CERTIFIABLE **GATHER TO FRAG**



T. LIAM MCDONALD is the all-knowing god of gaming. His mother still can't believe that he plays games for a living.

Berkeley, Seattle, The Village: they all pale in comparison to the microcultures arising on the net to promote everything from ferret grooming to Band-Aid collecting. Even though dunderheads such as Al Gore and Newt Gingrich yammering about the "Global Village" make me wince, there is something to all this connectivity and the way it allows people to hook up with like-minded others, no matter how obscure the catalyst.

Online gaming is not obscure, even though the majority of Internet users have never played an online game, and the king of all online games, *Quake*, infects gamers like a virus and keeps them hooked into their providers, fragging and being fragged into the wee hours. Hardcore gamers thrive on competition, and teams form to compete in organized online play. In *Quake*, these are called "clans," but similar groups have popped up around *Diablo* and *X-Wing vs. TIE Fighter.*

The number of *Quake* clans is unknown, though there are easily thousands. Most have their own web pages, logos, handles, and "skins" (the distinctive outfits they wear while playing). As Chris "Dakine" Jones, of Clan EG (The Evil Geniuses) points out, "The main purpose of a clan is to bring together a group of people with the same ideas, morals, and values, then build and organize a strategy that will beat the opposing clan. It's also a good way to make new friends."

> "We **devote** ourselves to **Quake**, for it is the one **true** thing. It **holds us together.** It shapes our thoughts. It **rules our every action**. We are **strong** and **supreme**. We are a smooth and fluid machine."

Clans forge their own identity and vie for bragging rights by challenging each other and then fighting it out. The Evil Dead, Grim Reapers, Hell's Minions, The Psycho Men Slayers (known as PMS, an all-female clan), and Crack Whores are among the almost 400 listed on Yahoo alone. Some have a theme: Clan Arrakis is dedicated to the *Dune* novels, the Manson Family fights for Charlie (or Marilyn, depending on who you listen to), the Jedi Knights swear by Jedi Creed ("A Jedi never acts from hatred, anger, fear, or aggression. To act from anger is to court the Dark Side," and so on), Da Gambinoz feature the theme from *The Godfather* at their web site and their motto is "Never go against the family." members of the Serial Killers have names such as Dahmer, PeeWee (as in Gaskins, I assume), Zodiac, and Lechter.

Clans reside all over the world—Brazil, the Netherlands, Japan, the UK, Australia—but most seem to be based in America and Canada, and most of these operate out of universities where students have fast Ethernet lines, unlimited connections, lots of spare time, and mass quantities of caffeine. Like anything, *Quake* and *Quake* clans attract a mixed bag of true gamers, people looking for friends and fun, and disaffected sociopaths. *Quake* has that lure. I've seen people still playing in a room they created 20 hours before. ("Have you been here all this time?" I asked one. "The fridge is close and I just pee out the window," was the answer.)

Some take it way too seriously, like the clan whose web page announces: "We are complete *Quake* junkies. We devote ourselves to *Quake*, for it is the one true thing. It holds us together. It shapes our thoughts. It rules our every action. We are strong and supreme. We are a smooth and fluid machine."

"The *Quake* 'subculture' has actually formed into a huge community," says Dakine. "Everyone has come together and contributed to the community in some way, whether it be making new mods, TCs [total conversions], new levels, or creating information gateways on the web, such as Blues News (**www.bluesnews.com**) or Redwood's *Quake* page (**redwood.stomped.com**). It's a community that's growing fast, and I'm very proud to be part of it."

Anyone can form or join a clan, and many servers run tryouts for new clan members. You need a few qualifications. Obviously, you have to be a good *Quaker* (no, not that kind), but also an extreme *Quaker* willing to put in serious time. You can't be a hot dog: clans work together and have leaders. If you're not a team player, you're not a clan member. And while almost all blow a lot of smoke and hurl insults and profanities with the best, there's a limit: you have to have a good personality and not be an antisocial nutcase. You have to earn your membership, and clans regularly eject members who aren't up to snuff or endanger team members.

Since David Kirsch developed Capture the Flag (CTF) play, clans and teams have become far more important. In CTF, you need to work as a team to get the other clan's flag and protect your own, and frags take a back seat to collective strategy. Each clan has strategies and gimmicks they use, like running plays in football. They know each level inside out, and can build complex ambushes or work defensive plans, such as guarding important health resources and weapons. Like any sport, they value sportsmanship and teamwork.

It's been interesting to see such a large and pervasive subculture arise around a single game in so short a time, with its own heroes, roles, organizations, events, and rules of conduct, all linking people from many walks of life and all corners of the world in the single and noble purpose of blowing the crap out of each other.

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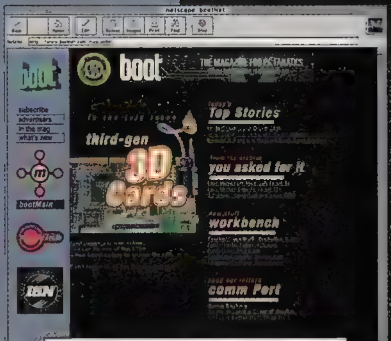
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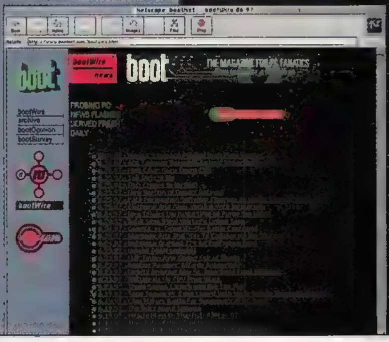
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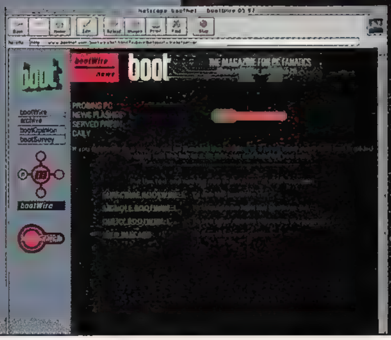
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ON THE LINE

WITH SHEL KIMEN

Death of the **Flat** Rate

TELECOM MEGALOPOLIES THREATEN TO RULE **THE NET**

Ten years from now, I'll be sitting in some post-apocalyptic bar reminiscing, "Remember when the Internet used to be free?"

In fact, I've already said that. When I was in high school, Internet access was free, through local freenets and BBS systems. When I got to college, it was still possible to get online for nearly free. And today... who can complain about unlimited access for less than $20? But how long do you suppose this is gonna last?

These are the facts (littered with my humble opinions):

Even as MCI trumpets its commitment to the Internet, phone lines are uniting under a single entity and it seems there's no way to block the very convenient next step in Internet pricing: per-minute service charges. After all, that's what this company knows best.

Wait! It gets better!

AT&T and SBC are talking merger. This would be the next largest merger in history, with nearly $80 billion in potential revenue. In April, SBC merged with Pacific Telesis, the giant that already owns Pacific Bell, Southwestern Bell, and Cellular One.

All phone lines, united by a single service, with per-minute service charges for all.

UUNET, the world's largest ISP is terminating its peering relationships—or plans to add a fee. "This is a purely economic decision," says John Sidgmore, president and CEO of UUNET. "We are 100 percent in favor of interconnection and won't deny access to anyone. However, where the use of our respective infrastructures would clearly be imbalanced, we cannot reasonably be expected to provide our transport, route management, and support resources at no charge."

> "We won't **deny access** to anyone. **However**, where the use of our **infrastructures** would clearly be **imbalanced**, we cannot **reasonably** be expected to **provide** our transport, route management, and support resources at **no charge**."
>
> ***— John Sidgmore, CEO UUNET***

What the press release meant to say was that the company has realized that as the telecom giants move ever-quicker toward per-minute pricing, there's no reason UUNET should be left out of the revenue windfall. Don't let the CEO's false modesty convince you that UUNET just wants to control its losses—there is some serious cash to be made.

Instead of charging ISPs a per-minute tax, the FCC prefers a flat tax based on the number of extra telephone lines in a household.

Local ISPs, however, will be hardest hit. Many ISPs have thousands of extra phone lines and the expense will put them out of business... unless some friendly telco steps in to buy your ISP account—just like financial institutions sell loans and credit accounts.

Case in point: MindSpring has acquired the accounts of eight small ISPs so far this year and plans to buy at least eight more before year's end, according to Cliff Bryant, MindSpring's manager of acquisitions.

UUNET is up to something, and heck, Sprint may as well get hip to the new world order. Seems like the new private exchange points—most likely owned by AT&T, MCI, and their subsidiaries—are going to yield healthy profits for these upstanding megalopolies, in addition to the anticipated per-minute surcharge on net access.

Several ISPs, including AT&T, GTE, EarthLink, MCI, Netcom, UUNET, and ANS Communications recently came together and formed Iops.org, allegedly to focus on industry-wide technical issues.

Make no mistake. Netcom, EarthLink, PSInet, and their ilk stand to lose the most in these negotiations—taxes, mergers, and all. Under their current biz plans, when they're forced to raise prices, customers will bail. Biz plan changes and corporate re-orgs seem pretty unlikely at this point. What *is* likely is that the ISPs (and existing customer bases) will be quickly acquired—less mess and less bad PR for the telecom companies.

SHEL KIMEN (kimen@well.com) has spent more time online than is reasonably healthy for one person and dreams in hypertext.

The not-for-profit Corporation for National Research Initiatives (**merlin.cnri.reston.va.us/home/cnri.html**) will run the IOPS. CNRI specializes in understanding networked environments—intimately. More than anyone, this organization understands not just how to access as many people as possible, but also how future access pricing could be maximized for the ISPs in the IOPS. Remember, the IOPS roster includes AT&T, MCI, and GTE. In this context, "not-for-profit" is a fantastic marketing ploy to offset the "for profit" agendas these organizations have collaborated on. No one suspects non-profit organizations of evil.

Supposing AT&T and MCI can democratize the net, making it affordable, and somehow learning to manage the billions of customers (and e-mail addresses, and DNS entries, and computer-related tech support), do we really want two companies to control the Internet? Not only will these two companies own (and profit immensely from) the backbone, exchange points, and communication lines, you can bet they'll also have a say about what content is—and is not—acceptable. And we're worried about Microsoft?

These possibilities make *Blade Runner*'s vision of the future look cheery.

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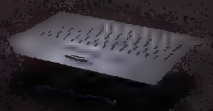
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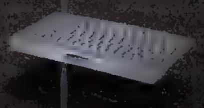
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Product Information Number 306

FAST FORWARD

WITH TOM HALFHILL

Another **Chip** in the **Wall**

MAKING A **MICROPROCESSOR** A **HOUSEHOLD NAME**

Imagine if people named their children the same way semiconductor companies name their chips. We'd have kids whose names were either silly or pretentious, or that told you almost nothing about what the kid was really like.

Come to think of it, people *do* name their children the same way semiconductor companies name their chips.

Still, that's no excuse. We don't buy children, but we do buy computers based on what kind of CPU is inside. And CPU names are downright confusing.

Take Intel's, for instance. "Pentium II" sounds like a second-generation Pentium. It is, sort of. Except it's really an improved version of the Pentium Pro. "Pentium Pro" sounds like an improved version of the Pentium, but it's really a whole generation beyond the Pentium. It would have made better sense if Intel had named the Pentium Pro the Pentium II, and had named the Pentium II the Pentium II Pro.

Confused yet? Hold on, it gets worse.

Until 1993, Intel's chip names actually meant something. The first chip in the series now known as the 80x86 or x86 architecture was the 8086. It built upon an earlier 8-bit chip (the 8080) while stretching the architecture to 16 bits. So the name "8086" made perfect sense—to anyone who mattered.

The original IBM PC had a variation of the 8086 called the 8088. This chip had a 16-bit core with an 8-bit I/O bus, so the name "8088" made sense, too. So did the names of subsequent x86 chips: the second-generation 80286, the third-gen 80386, and the fourth-gen 80486.

The root syllable **"pent"** made sense because the **Pentium** is the **fifth-generation x86**, but where did that **pretentious suffix** come from? Is it a **chip or a Roman god?**

But that's when Intel started taking detours. First came the 386SX: a 32-bit 386 with a 16-bit I/O bus. People associated the suffix "SX" with a narrower bus. Then Intel announced the 486SX. Was it a 486 with a narrower bus? Nope. It was a 486 without an FPU. People began associating "SX" with the concept of missing features.

By this time, AMD and Cyrix were making x86-compatible chips that also went by the names of 286, 386, and 486. Intel went to court, but a judge ruled that ordinary numbers aren't protectable trademarks. Intel was having second thoughts about those numbers anyway, because it was hatching a crazy plan to mass-market microprocessors on TV as if they were everyday consumer products, like bottles of dandruff shampoo. Nobody but an engineer would wash their hair with a shampoo called 80586. So Intel sponsored a company contest to dream up a consumer-friendly name for the next chip.

Intel paid a professional product-naming agency to come up with "Pentium." The root syllable "pent" made sense because the Pentium is the fifth-generation x86, but where did that pretentious suffix come from? Is it a chip or a Roman god?

People laughed, but not for long. A barrage of "Intel Inside" ads established "Pentium" as a widely recognized brand name among consumers—even though most couch potatoes don't know a CPU chip from a cow chip.

Pundits thought this name recognition backfired on Intel in 1994 when the Pentium was revealed to have a buggy FDIV instruction. If Intel hadn't made Pentium a household name, they reasoned, the scandal wouldn't have gone much further than techie trade journals such as *EE Times* and the *Microprocessor Report*. But the national media frenzy actually worked in Intel's favor. Today, few people remember the FDIV bug, and even fewer understand what it was all about. But everyone remembers the Pentium.

If only Apple could get this lucky.

TOM HALFHILL is a senior editor at *Byte* magazine and the author of two computing books. He first became interested in computers during the disco era.

The wild popularity of the Pentium did turn out to be a trap, though. The problem with marketing microprocessors as consumer products is that by the time you've burned the brand name into the Flash ROMs of people's minds, the chip's obsolete. The life cycle of a CPU is much shorter than the life cycle of a dandruff shampoo. Intel couldn't bear to waste all that hard-won name recognition, so the sixth-gen x86 is called the Pentium Pro instead of the Sextium. (Well, OK, it's not the *only* reason.)

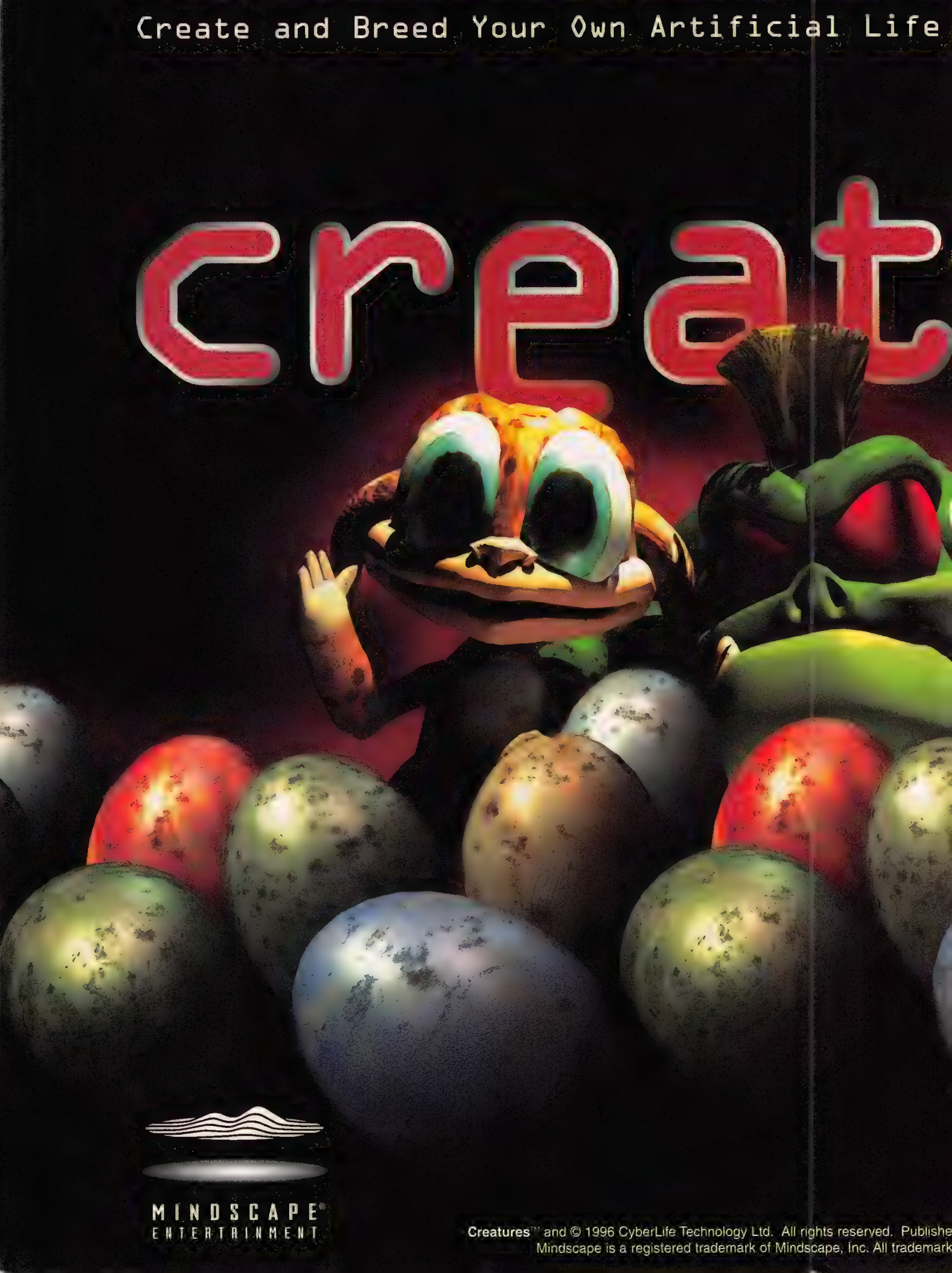
Unfortunately, some people thought the Pentium Pro was just an improved Pentium, not a next-gen processor. So Intel came up with "Pentium II." Kings, popes, and rich people have been adding Roman numerals to their names for centuries, so it clearly indicates a new generation. Sure, it's a little odd that the root syllable "pent" means five, not six.

Oh, yeah: MMX.

When it was still a secret project, it was called "MMx" (note the lowercase "x") and it stood for "multimedia extensions." At intro, MMx mysteriously morphed into MMX. "It's only a brand name," explained an Intel spokesman. "It doesn't stand for anything."

Right. And when AMD and Cyrix announced their "MMX-compatible" processors, Intel went to court to stop them from using this incredibly clever brand name. They've now reached a compromise, but wouldn't it be funny if AMD and Cyrix had simply advertised their chips as "MMx-compatible"? After all, it doesn't stand for anything.

It's a strange age when TV commercials sell microprocessors to couch potatoes, while the names of those microprocessors no longer make sense to techies. b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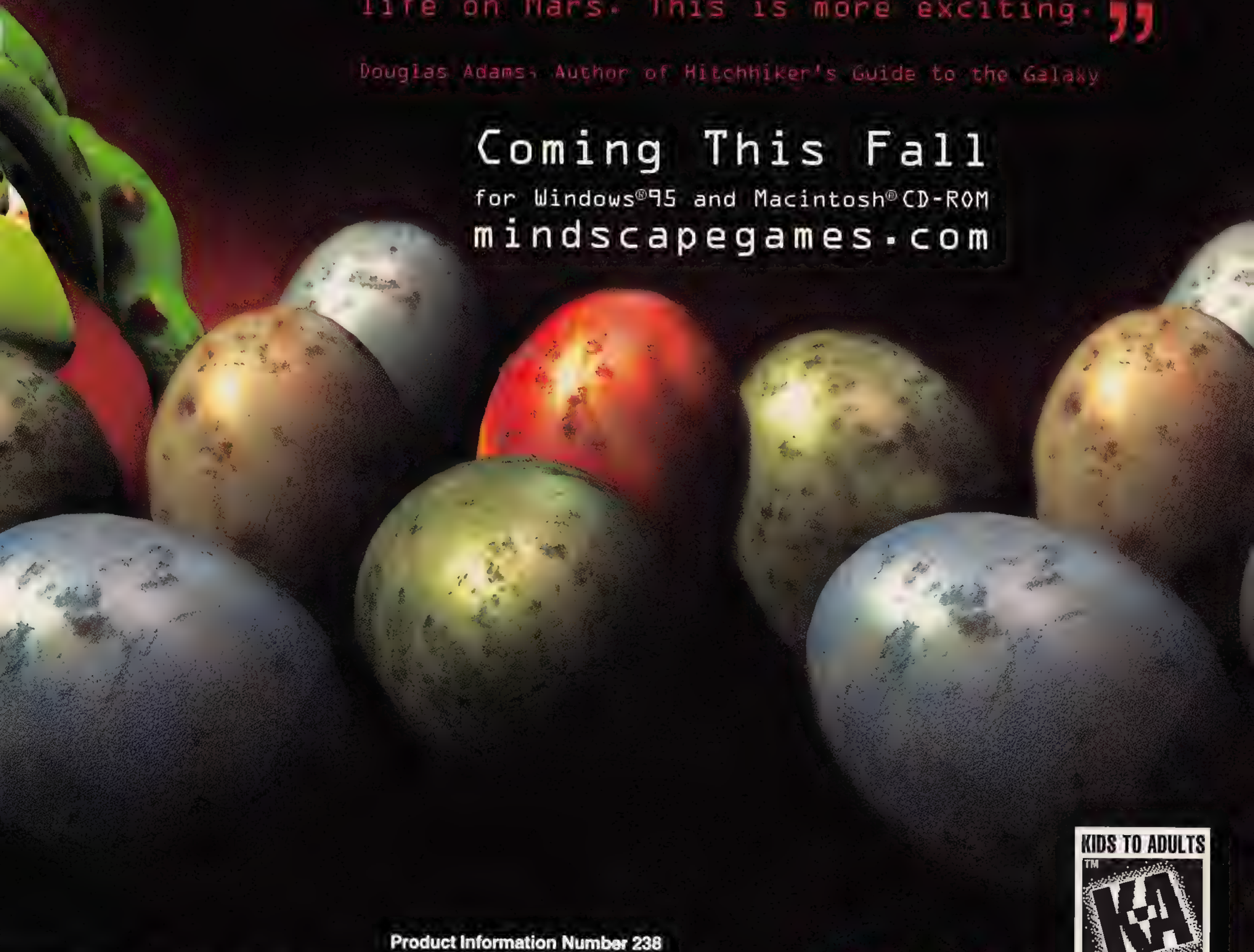

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ket Jockey

boot ***[illegible]***

Hawkins [illegible] ade us think we had the guts to go out and tell [illegible] to come up with this screwy little alphabet [illegible]

[illegible] to learn how to use a keyboard, too, and that's much harder. It takes weeks to learn how to touch type if you're lucky! You can learn *Graffiti* in 20 minutes.

boot ***Xerox is suing U.S. Robotics over Graffiti, asking you to cease and desist. Will you?***

Hawkins [illegible] they have related to *Graffiti*, but *Graffiti* is our product—it's a technology we own, that I designed. And we don't believe there's any basis for that suit. We are not going to cease and desist selling Pilots or *Graffiti* in products.

If someone else built a product that looked like Pilot and had a *Graffiti*-like product, they'd probably sue them too.

boot ***Is there any one product that could be a formidable opponent?***

Hawkins [illegible] n't too many products like the Pilot [illegible] different. Sharp has announced a [illegible] ling in Japan.

boot ***[illegible]***

Hawkins [illegible] w the number of it. It's [illegible] sn't have a keyboard but it doesn't really [illegible]

boot ***[illegible]***

Hawkins [illegible] e pop-up keyboard on the screen. I've only seen the Japanese version. Until it ships here I'm not too worried about it. [illegible] it Japanese companies don't typically understand platforms at [illegible] on't understand operating systems, they don't under- [illegible] synchronization. So it might look a lot like the Pilot, but it's not going to behave like one and it won't be as successful.

I worry much more about the product we haven't seen yet–my worst competitors who design an exact Pilot knock-off and put a billion dollars behind it. How do you compete against that? Clearly [illegible] mp–I worry a lot about them, but not with [illegible] ey're shipping today.

boot ***[illegible] e Pilot as "the Newton MessagePad done right." Would you agree?***

Hawkins I'd say it's handheld computing done better. I don't want to contrast with the Newton because I'm not sure if I even know [illegible] at the Newton really is. But I think the vision the early Newton [illegible] dheld computing is the same vision we had. We just took a different approach and have been more successful.

We failed at first, like everybody else. Palm was originally a software company and we were working on other people's PDAs. We worked with Casio and Sharp and Hewlett-Packard and even Apple.

That approach failed because the first round of PDAs were all terrible. We knew what to do, but we couldn't get anybody to do the right thing. So three years ago, we were sitting around with one of our board members, commiserating about how miserable the PDA market was. He said, "Well, do you know what to do?" I said "Yeah, I know what to do." And he said "Go do it." So we did.

That involved changing from a software company to a hardware and software company that does a lot more aggressive stuff. I came up with a few things that we targeted: First, size is [illegible] want very simple, focused functionality. Third is speed. People don't compare a Pilot to a PC; they compare it to paper. And it's got to be better performance than paper. We did studies to see [illegible] We had to be quicker than that.

> "The **Pilot** is the **largest** product I ever **want** to **make.** It should be **smaller** as we go **forward.**"

The next thing is cost—it has to be inexpensive. We targeted $299 for our initial entry price, which was very aggressive at the time. And the last thing it had to have was seamless connectivity to the PC so that when you backed up your data, it was trivial—one button, it all happens. Those are the things we did right in the first Pilot.

boot ***So you knew what not to make, but how did you decide exactly what the Pilot should be?***

Hawkins I've been doing portable computers my whole career, which is now spanning 18 years. I did it at Intel. I did it at a company called Grid Systems. So when we started Palm, there was a lot of solid knowledge about how people used handheld portabl systems that just sort of effuses through your person [illegible] knowledge base. We have a lot of other [illegible] backgrounds. It was a combination [illegible] and talking to the customers wh [illegible] Newton.

boot ***How much does consum [illegible]***

Hawkins [illegible] absolutely have to talk t [illegible] the time. We do monthly [illegible] also do phone surveys and focus groups. You have to listen to what they say.

On the other hand, you can't listen to them all the time. Sometimes they'll tell you they want something and you'll have to say, "But if I give it to you, you're not going to like it." That happens a lot. It's tricky to know when to listen to them and when not to listen to them.

Nobody told us to do a PalmPilot. They told us that they wanted a Newton that was smaller and faster and cheaper. It's a big difference. You have to combine your own original thinking and vision of a breakthrough new product with listening to customers very carefully for how to rev the current product.

boot ***So how long did it take all these elements to gel into the first Pilot?***

Hawkins I said I knew what to do. I actually didn't at the time, but I figured I'd figure it out in 24 hours. So the next day I had a cardboard prototype of the Pilot—it looks just like the final version.

boot ***Really? Exactly like the shipping Pilot?***

Hawkins Very close. We didn't have the buttons laid out like this. I made it in my garage. Had a cardboard cradle and a cardboard box the same size, I picked a 150x160 display and said, "We can make this for $299." It took a month to get the program really rolling. Some of our investors thought it was crazy. But we did it anyway. We had $3 million left in the bank and we basically figured we had to develop the product from that fund. We had 28 and we built the Pilot up to preproduction on those funds.

The product was conceived May of '94. And we introduced the product January '96.

boot ***What features from the original design were left out of the finished product?***

Hawkins Very few. One thing we did right was spec the product very carefully. And I refused to let anybody compromise.

We didn't spec PCMCIA, we didn't spec infrared, we didn't spec a keyboard, there was no expansion port in the traditional sense. So there were a lot of things we just didn't spec to begin with. One of the few things we ended up not doing was a memory card on the back for program and data storage. Originally we had hoped to put two cards, so you'd be able to upgrade just the user data storage without changing the ROM. But we couldn't find a reliable connector that would fit into the package for two of those. That was a very minor loss.

boot ***Why didn't you spec some of those other features, such as an IR port or PCMCIA support?***

Hawkins Back at that time, it was perceived as radical or crazy not to put something like that into a handheld. Everybody had it. In fact, some had two slots for PCMCIA cards. We just asked, "Does the customer really value what's being given to them?" We were trying to meet size and cost goals and all those things add cost.

PCMCIA for example, makes the product a lot bigger. There's the perception that you can plug anything into a PCMCIA slot and it works. In reality, almost nothing works when you plug it into a PCMCIA slot! Plus, our very low power system would restrict it even further. So we'd have to come up with a very short list of things you could actually plug in.

Giving that "extra value" to a customer actually makes the experience worse and makes the product bigger. On the other hand, customers felt it very important to be able to upgrade the product, so we're the leading edge in having this memory card that lets you totally change the nature of the product. I can upgrade the software and the storage on the PalmPilot and no other product available today lets you do that. So when we got rid of PCMCIA, we decided, "Hey, give them something that's really valuable: an upgrade path." I think that was the right choice.

We didn't put infrared in there because what you can do with infrared doesn't make a lot of sense. You can print with infrared, but we don't print from the Pilot, we use PCs for that. You can exchange data, but there weren't enough products out there to beam between one another. Now that there are a million Pilots out there, I'll probably add infrared to them. But for starters, get the price, get it out, and get good functionality. It's what people want.

boot ***In addition to IR, what other features would you like to add to the next version?***

Hawkins The weakest part of all these products–not just the PalmPilot, but all the competitors as well–is the display technology. Ours is as good as anybody's, but they all stink. Not all the people who own a PalmPilot have good eyesight and a lot of them have trouble reading the screen. The contrast isn't as strong as we'd like. I'd really like a display that looks like a piece of paper–a white white with a black black on it or color would be ideal, but the technologies for portable products and low-powered displays are just not there yet.

boot ***Did you know there are currently 2MB hack upgrades available?***

Hawkins I didn't know that! I know some people are talking about it.

boot ***Yeah, you can solder on top of the current chip. When will you guys be offering your own and what (if any) memory limitation does the Pilot possess?***

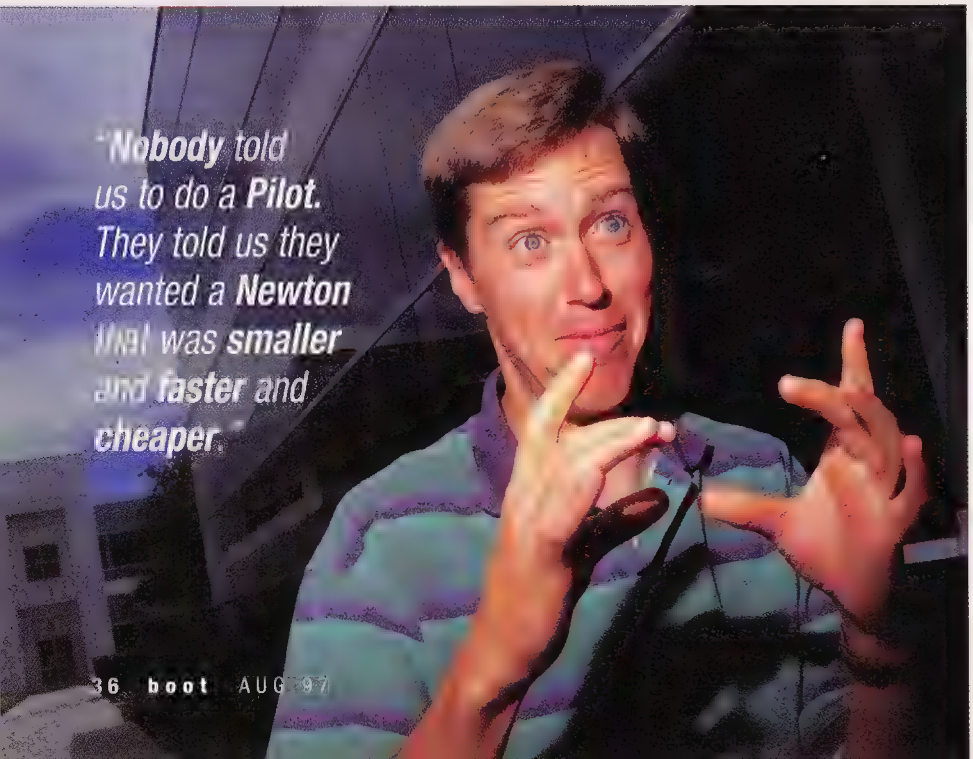
Hawkins Well, we don't sell 2MB upgrades because there's very little demand for it. That doesn't mean there aren't people who don't want it. If we sold it today, we wouldn't sell a lot. It's easy for us to do that product, but there's cost in producing it and selling it and getting it out. There's no technical reason why we couldn't put 4MB on a PalmPilot today. The processor can address more, but I think the bus on the current memory card can go up to 16MB. But from an architecture point of view, there's no reason we couldn't put 32MB, maybe more. With a megabyte of memory, it's very hard to fill up.

boot ***What's the biggest performance bottleneck?***

Hawkins Some of the database engine stuff gets slow, but not many people have 10,000 records! It's something we're aware of and we've architected how to address that as we go forward.

boot ***The Strong Arm Processor has a lot of horsepower with a very small formfactor. Can your foresee the day when we're going to get processors in the PalmPilot with that much power?***

Hawkins I think someday we'll have a



"Nobody told us to do a **Pilot**. They told us they wanted a **Newton** that was **smaller** and **faster** and **cheaper**."

much faster processor in the PalmPilot. That's not one of our problems. The performance is excellent for almost all situations and we don't have people asking for more processor power.

Going forward, can I imagine applications that would require more processing power? Yes. And will there be faster processors in some future products? Almost certainly, but it's not a high-priority item today.

boot ***What sort of limitations do power management and formfactor pose?***

Hawkins A whole bunch of limitations roll into one another. To design this product with the battery we wanted and the price we wanted, we had to deal with a whole series of issues. It dictated the architecture of the OS. We ended up with a single-tier memory architecture.

It's not a limitation, but it's a design consideration.

You end up designing the product differently. This is why we talked about, like Windows CE—it's very difficult to make a WinCE product that works like a Pilot because it's a two-tier PC architecture. We don't bring data into some temporary stores; we don't bring apps into temporary stores. It's all single tier.

So what are the limitations? There aren't many, but there are a lot of architectural issues.

boot ***Will the next PalmPilot be backward compatible?***

Hawkins As much as possible. That is a goal of ours. When we introduced PalmPilots, we

PILOT SHOT DOWN

boot ***Where did the name "Pilot"come from?***

Hawkins I came up with it originally. When you name products, you ought to name it right early on because it sticks and you really have trouble changing it later. We didn't follow that rule with the Pilot. The original code name for the product was "Touchdown." And we knew we weren't going to call it "Touchdown." By the time we actually got around to naming the product—several months before it was being introduced—it became a problem. Now we have all these people working on it, everyone has an opinion, and any name you come up with, somebody's not going to like for some reason.

I originally proposed the name "Pilot" because it had a lot of good connotations. It implied travel, it implied mobility, it implied someone watching out for you and guiding you. But it was shot down! Somebody in marketing didn't like "Pilot." So it got down to the wire and we couldn't come up with a name and we were having materials and press releases and stuff printed. We really panicked. The marketing folks came back to us and said "Hey, *Pilot* wasn't so bad! Why don't we try that?"

boot ***The marketing guy that shot it down… is he still with the company?***

Hawkins I actually don't remember who it was. Come on, everyone has an opinion. There's no right answer to these things.

*"**Japanese** companies don't typically understand **platforms** at all, they don't understand **operating systems,** they don't understand **synchronization.**"*

couldn't make everything backward compatible. We added a backlight, which a lot of people wanted, but there's no way to upgrade existing units. But every software feature, the additional storage, the additional performance—everything else, we upgraded all the existing owners. No one else even comes close to doing that in this business. We're very conscious of maintaining investments made in the PalmPilot. So I can guarantee that anybody buying a PalmPilot today will be able to upgrade it to some extent as new functionality comes out.

boot ***I notice you're using a Ricochet wireless modem on your PalmPilot.***

Hawkins Yeah, I use one. Today there are several wireless options. It's very intriguing for some people and I think those products will do well. NovaTel Wireless has announced CDPD cradle radio attachment.

I'd like to see a lot of that functionality integrated in the product, because it's a really big downside having to snap the Pilot into something.

Look what we did on the desktop—a cradle that comes with the Pilot. A lot of people said, "Just plug the cable into the bottom of the Pilot and make it sync, it's cheaper." We said, "No, that's too hard. People just want to drop it in and push a button." We tested it in focus groups and it made a big difference. Same thing with wireless capabilities. When we do wireless in the PalmPilot, it's going to be that simple—one button, no configuration.

boot ***Would you up the price of the PalmPilot to add these technologies?***

Hawkins Sure, absolutely.

boot ***What's the highest price you'd sell a PalmPilot for?***

Hawkins Depends on the technology. There's no pat answer. We still have our entry-level product at $299. And it's important to have that product point, but once you're addicted to the PalmPilot and it becomes a part of your daily life, then you can justify more. We have people who buy multiple PalmPilots, just in case they lose one.

You have to remember that even $299 is a lot of money. There are not too many things you spend $299 for. So it's a goal to reduce the price. I look forward to the day when every college student, every high-school student owns one. At that point, I'd have to be selling it for $99. It will happen.

boot ***Any plans for a more rugged or waterproof PalmPilot?***

Hawkins It's not something we have planned. I've heard rumors of other people repackaging them and sealing them up.

boot ***Would you license that?***

Hawkins For all I know we may be doing that already.

boot ***So you may not know what's going on...?***

Hawkins I don't know about 97 percent of the stuff that goes on! There are too many deals that happen every day. I'm more worried about how we're going to beat the competition and how we're going to come out with the next breakthrough product.

boot ***What will Windows CE do to the PDA market?***

Hawkins The first generation of Windows CE products certainly raised awareness of the product category.

boot ***That's a good thing, right?***

Hawkins We think that's a plus. But we're not foolish enough to think that Microsoft isn't sitting there with their sights set on us, which we suspect they are.

boot ***You think you're in Microsoft's bull's eye?***

NOBODY MOVES OR THE BETAZOID GETS IT!

boot ***What do you think of the Tricorder app?***

Hawkins I've seen it, but don't ask me tech questions about it!

boot ***We were wondering if anyone had ever robbed a bank using a Pilot and the Tricorder app?***

Hawkins How? With the noises and beeps and such?

boot ***Exactly. You could start up the Tricorder app and say it's armed to go off.***

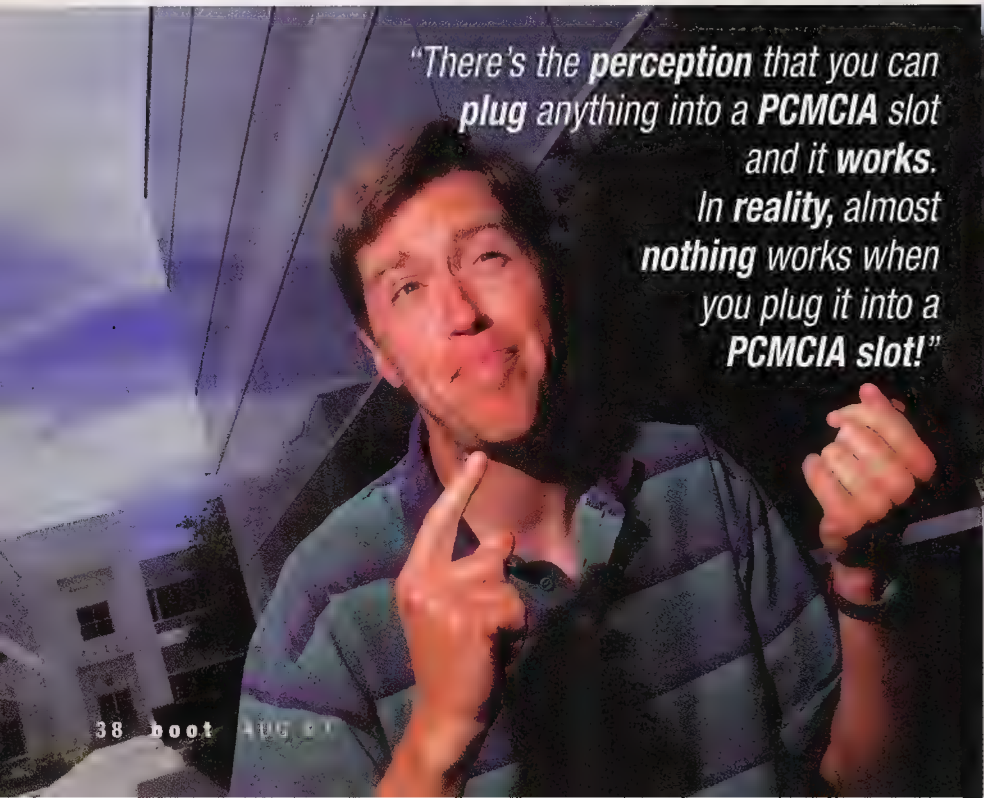
Hawkins I don't want to suggest...

boot ***You haven't heard of anybody robbing a bank with one?***

Hawkins I haven't heard of any illicit uses of the Pilot yet. It may have happened, but...

boot ***If you do, will that be the indication that it's a bona fide success?***

Hawkins There have been many times when I've said to myself, "I guess it's made it now," after we've heard someone using it for something.



"There's the **perception** that you can **plug** anything into a **PCMCIA** slot and it **works**. In **reality,** almost **nothing** works when you plug it into a **PCMCIA slot!**"

Hawkins Well, the PalmPilot has been far more successful than the Windows CE devices. The current CE devices are little PCs. They have keyboards, they try to run PC software, and they try to have the PC experience. If you look at how the companies are differentiating the CE products, the ones touting differentiation are moving more in line with a PC–bigger display, bigger keyboard, or color, etc. And that's actually going to drive those guys in a different direction from where we are. We want to go the other way: we want to go smaller and cheaper, more focused on functionality.

What will happen in the future I don't know. We live by Andy Grove's paradigm: we are paranoid. We constantly worry about our competition. But we're also confident we can succeed against the competition—including Microsoft—and we can attack them on multiple fronts: product, relationships, avenues of selling. There are a lot of ways you can skin that cat.

boot ***Do you work a little bit harder, knowing this?***

Hawkins Yeah, absolutely. Well, not harder, but more focused. When you've got competition, it's much easier to say, "I agree. That feature is a great idea. But if we don't ship in a month, we're going to have our lunch eaten." It allows you to really pare down and say "OK, what is really critical here? What do we have to do and how do we get it done quickly?"

The real magic in product design is knowing when to say this feature is really important and we should add it, and when you should punt on it. It's extremely hard for people to say no to features.

boot ***If you didn't have a PalmPilot, which PDA would you use?***

Hawkins Before the PalmPilot we used everything. Psions, HPs, we used General Magic devices.

boot ***And if I took your PalmPilot away from you...***

Hawkins I wouldn't let you! It's not a fair question! The next choice down would be pretty far removed. My next-favorite PDA is a Psion. It's one of the nicer designed ones.

boot ***Who's the most famous person you know that's actually using a PalmPilot?***

Hawkins There are some high-level White House folks using them. There's also a rock musician. I don't remember the name. Baseball players use them for keeping track of pitchers. Oh, and John Travolta, too.

boot ***Who is the typical PalmPilot user?***

Hawkins In the beginning it was predominantly male, predominantly advanced PC users. They had reasonably high incomes. In the beginning, we joked that it was sort of the rich-male-computer-guys-who-were-looking-for-a-PDA type of thing.

That quickly changed. Now it's much more across the map. Users still tend to be professionals and people who make a reasonable income, but there are also students and retired people. The women quotient is going up significantly. We want that to go up, but it lags a little. They're more cautious.

boot ***Why do you think they're cautious?***

Hawkins Because they're smart! But I know a lot of women who use the product and just love it.

boot ***What's the most common complaint from consumers?***

Hawkins The number 1 complaint we used to have was the lack of a backlight. So we solved that. I'd say the number 1 support call issue has to do with configuration problems on Windows 95, which is not surprising. You install something in Windows and people get in trouble. The biggest feedback we get is that some people, generally older people, find the screen quite hard to read in some situations.

boot ***Have you attended a focus group?***

Hawkins Some, but not most of them. When we do focus groups we usually get back audio and video tapes. Good commute time stuff–pop it in the car stereo and listen to these people for a half an hour.

boot ***Gaming's been a big part of the PalmPilot's success. Does that surprise you?***

Hawkins Not too much. We didn't put the buttons on the bottom to be a good game machine, but we certainly were cognizant of it.

Early on, we took GameBoys apart and asked, "What's in this that isn't in a PalmPilot?" And the only thing we didn't have is Sprite engine hardware and they have better sound. But it's pretty close.

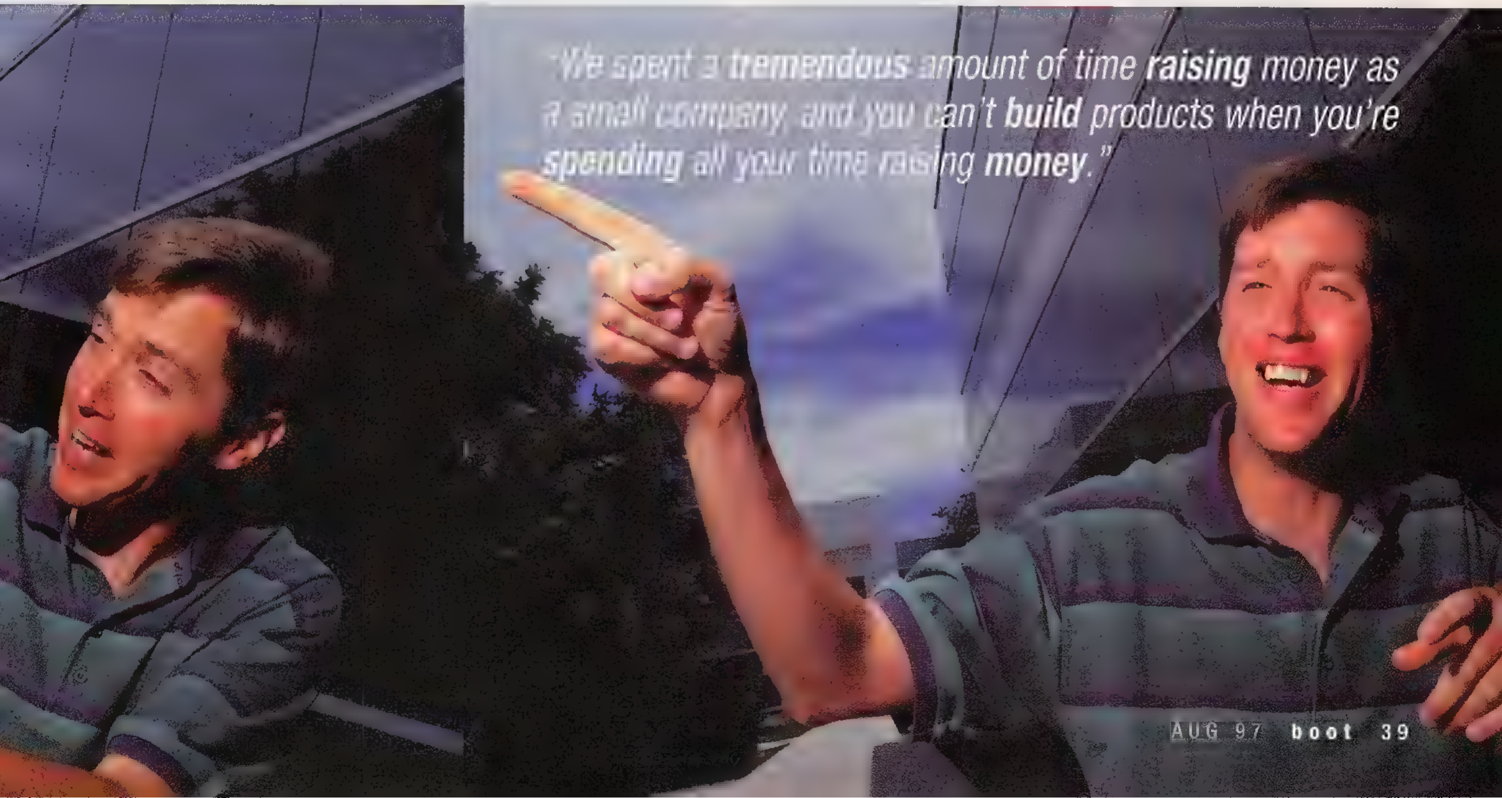
I remember thinking that the symmetrical button layout is better for gaming because you can hit the arrow keys with either your left or right hand. This was definitely in the plan. In fact, the first few games were by one of our employees, Roger Flores.

boot ***Any plans to port GameBoy cartridges?***

Hawkins We're not going to do that. I've heard on the net that there's a renegade GameBoy interpreter out there who can take those games and run it on a 68000. I think it would probably be illegal. So we're not going to do it. But I wouldn't be surprised to see someone else do it!

boot ***So you're not talking to Nintendo?***

Hawkins Not until we have that $99



"We spent a **tremendous** amount of time **raising** money as a small company, and you can't **build** products when you're **spending** all your time raising **money**."

product. At $299, $399... people aren't buying PalmPilots for games. They may play a lot of games, but they don't buy them for games. The shareware developers are doing a good job with games.

boot ***What's your favorite PalmPilot app?***

Hawkins I get addicted to the games. I'm a thinking-game guy. So my most addictive game is this solitaire golf game. I've used so many batteries since I've got this thing. Another one of my favorites was done in Japan, it's called *Single Numbers*. It's a real head game. You have to put numbers down in this grid and figure out how to make it one through nine in all the directions.

This new game just came out called *Pikoban*, it must have come from Japan. It's a very clever game of moving around little boxes in a warehouse. I like that one too.

And I like chess. It was a very quality implementation of chess.

boot ***What about the worst?***

Hawkins There are a lot of goofy things out there. Games that just don't do anything, but they're not "bad." I regularly go to Adam's page (www.inforamp.net/~adam/pilot/) and download anything that's new. I try it all out just to see what people are doing. Some of it tickles my fancy, some doesn't.

We have no religion about who writes the software or where it comes from. There's a whole section on Adam's web page devoted to "worthless but interesting apps" or something like that. Apps that just don't do anything. There's a GPS app, totally useless, but he admits that up front! Basically it puts a big X on the screen and says, "You are here." That's all it does! He says it works flawlessly anywhere on Earth, and it does.

One of my favorite little almost useless is this little moon calendar. Just bring it up and it tells you what phase the moon is in today.

boot ***What's going to be in your pocket or your hand two years from now?***

Hawkins Hey! That's another way of asking me maybe what we're working on, but I don't have to say what we're working on...

Let's see if I can answer that. I think you'll find everything that's in a PalmPilot today, but better—better display, better performance, smaller, cheaper, faster. And I would expect some very cool communications stuff.

One thing you're going to see in the future is very low-powered, wireless packet radio networks. That infrastructure isn't in place today, but it will be built out. And I'm not going to say exactly the order of how that's going to happen, but it's going to happen—10 years from now you'll be wirelessly connected to the Internet and it will be running on AAA batteries. And it will cost $299 or less.

boot ***Many people use their computers for heavy-duty PIM purposes. Can PDAs meet all those needs?***

Hawkins I've always felt the reason the desktop PIM business never did well was because a PIM belongs in your pocket. So the PalmPilot is a great PIM.

Will there be a day when I use a PalmPilot or some product like it without a desktop somewhere? That's possible. But you have to solve the backup problem. Today it's easy, you just pop them in the cradle and it syncs.

There are creative things that can be done. People are providing services for the PalmPilot today where you can sync with their server, using a modem, and you don't need a PC in your life. But it's not for everybody.

I think there will be a day when some people will not need to sync with a PC.

boot ***When's that going to be?***

Hawkins Right now it's not limiting our sales–to say that you have to have a PC somewhere in your life. So for people buying a PalmPilot today it's not a problem. Now if I want to get every mom and pop and every kid... you need to have access.

boot ***How about Java-based PDAs?***

Hawkins I'm a Java fan, and I'm trying to understand the role of Java in the PDA space. It's a great development tool.

There's one person who did the Java runtime library for the PalmPilot, so you can compile Java code and run it. There's a bunch of software that's been written in Java on the Pilot. One guy is doing a Java interpreter. By its very nature it would have to be limited, like the Basic interpreter is limited. I'm still on the fence as to how important that is in our future. We've sold a lot of these into Sun. Your readers can tell us what we ought to do with it.

"We're **confident** we can **succeed** against the **competition**—including **Microsoft**—and we can **attack** them on multiple fronts... There are a **lot** of ways you can **skin** that **cat**."

DOCTOR SHRINKER

boot ***How small is too small?***

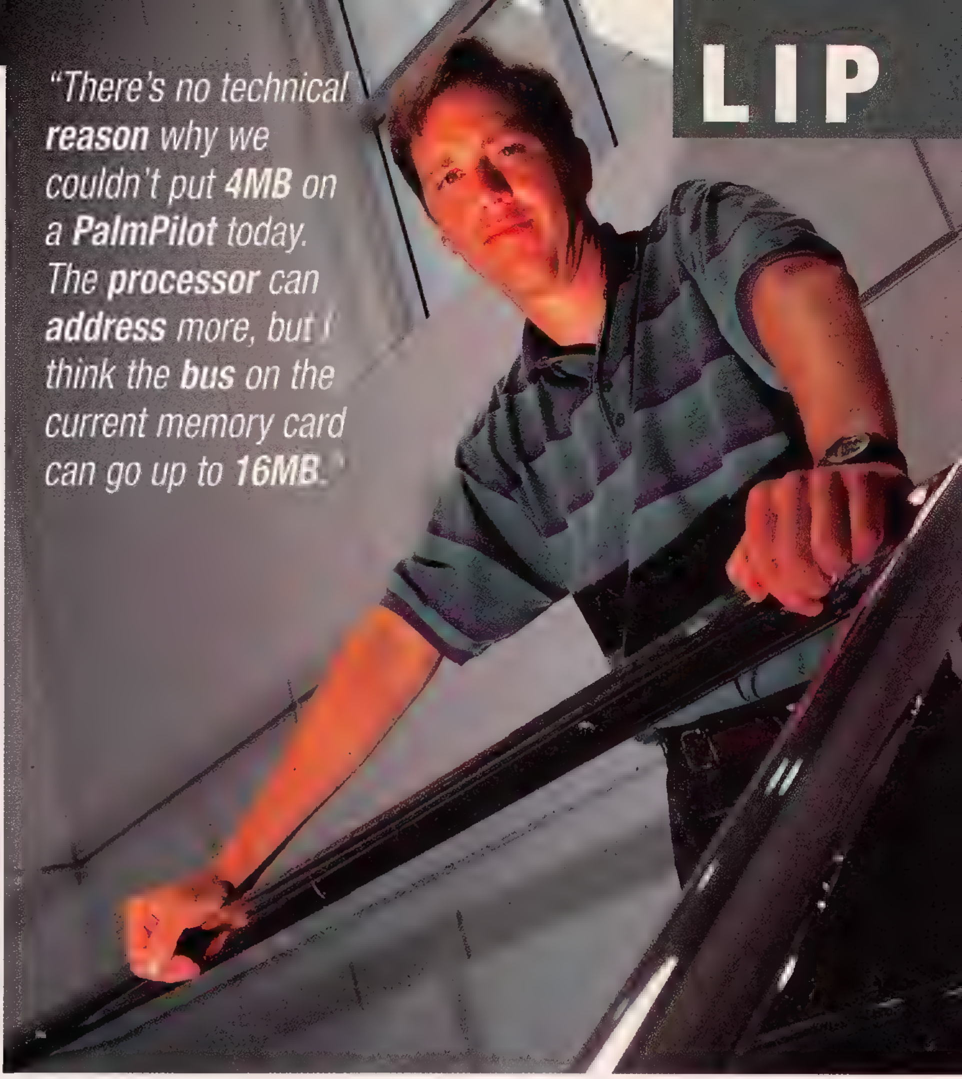
Hawkins There's sort of a yin-yang going on here. You want the product to be as small as possible, but on the other hand you don't want the screen and the user interface to be small. Clearly, you can make the product thinner. That's desirable. You can make the product somewhat smaller. But I'm not going to reveal any thinking too much in this direction, but you can make the product smaller in its horizontal directions—width and height—without compromising the UI experience.

boot ***Is smaller better?***

Hawkins When you ask people, "What do you like about the PalmPilot?" the first thing they say is the small formfactor. People roll-up a lot of things, such as the user interface, the way the buttons work, the immediacy of the product into the form factor. But those are user-interface issues, not necessarily size issues. It's one of the reasons the Pilot has struck people, "Hey, I can use this and put it in my pocket."

boot ***How much smaller would you like the PalmPilot to be?***

Hawkins Geez! I don't know! I'm a practical guy, so when you ask me a question I always mold it with my knowledge about technology and what's do-able. I know I can't make this product two millimeters thick and rigid. But if I could, I suppose that would be nice. But could I make it half as thick? Yeah, I could make it half as thick. Could I make it 10mm or 12mm thick? Yeah, I could do that.



"There's no technical **reason** why we couldn't put **4MB** on a **PalmPilot** today. The **processor** can **address** more, but I think the **bus** on the current memory card can go up to **16MB**."

boot ***What applications would you like to run on the PalmPilot that you can't?***

Hawkins I don't really want to tell you what I think the killer ones are.

boot ***Why not?***

Hawkins Because I want to keep them secret until we introduce them!

We have lots of products in development. The PalmPilot today is an organizer, plain and simple. But we don't view ourselves as an organizer company. We're a handheld computer company, and we have a vision for what people can do with handheld computing.

We started out saying, "OK, it's an organizer." But it's really a view of the data that's on the desktop. We called the Pilot a viewer. We didn't call it PDA internally. It's like a little window on the data that resides on your PC.

The next step was to expand that to a little window on a LAN. And we did that with the latest release.

But there are other repositories of data. The Internet represents one. Financial data is another. We think there's a very ripe opportunity for figuring out how to get information into the PalmPilot. And we're working on a lot of these things.

boot ***Give us a hint.***

Hawkins I'd be shot if I told you! I can't, other than the allusion I just made to the fact that we have large plans for the product family and we will be making multiple types of Pilots that do different things in different environments.

This isn't a one-shot company—this is a big business and it's going to be a very large business. It's just getting started. Just like PCs go for different types of applications and avenues, we're going to be doing the same thing in the handheld market.

This is not millennium talk here. In the next year or two, you're going to have some very exciting products from us–things that incorporate new communications options and new technologies.

The products we're working on today are far more exciting than the PalmPilot itself.

boot ***Palm Computing was a small independent company. Then you joined up with U.S. Robotics—a much bigger company—and now USR has been scooped up by 3Com. Is the new regime more draconian?***

Hawkins I don't know if I'd volunteer the term "draconian." Clearly it's different. We were an independent startup and now we're part of a much larger company. There are pros and cons to that. But the positives vastly outweigh the negatives.

We spent a tremendous amount of time raising money as a small company, and you can't build products when you're spending all your time raising money. U.S. Robotics enabled us to fund the launch of the product properly.

There are also synergies on the communications side of the house. It's been a really good relationship. Also the name, U.S. Robotics, has been a real help for us too.

There are also some downsides. You're used to doing everything your own way and you have to change. Fortunately, we're still pretty independent. We're in a USR facility, but 90 percent of the people here work in the Palm division.

We take advantage of the rest of the company when we need to. We use the manufacturing capacity of U.S. Robotics. That's great. The purchasing power. That's great.

boot ***Because the Palm division is so different from 3Com's primary mission, there's been some speculation that your division might be sold.***

Hawkins Ah, it's not for sale, absolutely not. We're a happy division of U.S. Robotics; and very shortly we'll be a division of 3Com.

There's no friction, there's no need to sell the company, there's no discussion. Although I can't say that couldn't happen in the future. Look at Apple spinning out the Newton group.

boot ***But generally 3Com is happy to have you onboard?***

Hawkins Oh yeah, one of the great things about 3Com is they all own PalmPilots, every one of them. They love the PalmPilot. And it's a good synergy. Our future product plans extend the networking environment, so Palm actually fits in pretty well.

boot ***So do you ever get a 3Com executive calling up and going, "Gee, could you add this feature?"***

Hawkins We get a little of that and it happened at USR, too. I've had a lot of conversations with Casey Cowell [USR's CEO] about features he'd like to see in the product.

Look at the PalmPilot with the backlight. We changed the power button so there's a dimple in the center, because Casey told me one day that he likes to use his pen to turn it off. It added a detail to the new product so you know this product has a back light. We call that the Casey Cowell Dimple.

We also get a lot of crazy requests that we haven't done, too.

boot ***Last question: Do you get free tickets to Giants games?***

Hawkins There's a cartoon that was published in the internal house magazine where in one corner, they had a USR employee saying "Gee, I wonder if we're going to get free tickets to the 49ers?" And then on the other side you have the 3Com employee saying "I wonder if they're going to give us free Pilots?"

We haven't gotten tickets yet.

OPERATION:
KILL THE PEN

AMD and Cyrix are on a mission to assassinate Intel's MMX chip. Are their mercenary processors a couple of bumbling hit men or high-precision marksmen you'd be proud to take home to mother? The answer can only be found on the sprawling plaza of Socket 7.

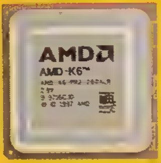
Intel Inside. The stickers are everywhere—for now. As the mighty leader of the Silicon Nation moves forward with Pentium II, Slot 1, and the Single Edge Contact cartridge, gunmen on the peripheral are taking potshots at the commander-in-chief's suddenly wide-open Pentium MMX market. Advanced Micro Designs and Cyrix believe there's still plenty of life in Socket 7, and are transporting Pentium-level MMX mercenaries to claim open international waters.

The assassins have attempted takedowns before. AMD has been in the silicon game since 1969, and began battling Intel in 1991 with the introduction of its AM386 processor. Cyrix leaped into the foray with its math coprocessor in 1988, and set its sights squarely on Intel with a 486 clone in 1992.

Neither company has made much of a dent in Intel's body armor, but 1997's window of opportunity gives AMD and Cyrix a much clearer shot. The upstarts acknowledge Intel's Slot 1-based new world order, but are betting on OEMs and crafty home hobbyists to embrace Socket 7 for at least another 18 months. This time AMD and Cyrix are deploying chips with competitive firepower and bargain price tags.

Can AMD's K6 and Cyrix's 6x86MX kill the Pentium? Read on for full transcripts of eyewitness accounts and laboratory forensics analysis.

AMD K6: Lurking in the Motherboard Depository



Take heed, Intel, for AMD's K6 processor with MMX technology packs Pentium-piercing ammo. Three K6 processors—166MHz, 200MHz, and 233MHz—are available, all running at a 66MHz-system bus speed and a 33MHz PCI bus speed. The 8.8-million-transistor K6 processor is manufactured using AMD's 0.35-micron, five-layer-metal silicon process technology, and uses 321-pin ceramic pin grid array packaging and Controlled Collapse Chip Connection flip-chip interconnection technology.

The K6 bristles with AMD's RISC86 superscalar architecture: simply take your x86 instructions and internally translate them to commands that adhere to the RISC performance principles of fixed-length encoding, regularized instruction fields, and a large register set. Why execute convoluted x86/CISC commands—which vary in length from one to 15 bytes—when you can work with fixed-length, efficient RISC86 operational code? The Instruction Control Unit (ICU) controls and buffers these operations, handling up to 24 RISC86 operations at a time. This buffer size is designed to match the K6's six-stage RISC86 pipeline and seven parallel execution units. The ICU can shoot out up to six RISC86 operations at a time. These operations include: branch conditional evaluation, complex integer or MMX-register operations, floating-point register operation, simple integer register operation, memory store operation, and memory load operations.

The K6 also relies on branch history/prediction tables, and branch target cache to help reach targets. Toss in twice the L1 cache of Intel's P55C MMX processors—32K

TIUM

intel
pentium

by Andrew Sanchez

for instruction cache (with additional pre-coded cache), and 32K for write-back dual-ported data cache—and you have enough power to scatter the Intel motorcade.

"The K6 is comparable, if not faster, than the P-II, and faster across the board when compared to P200 MMX," says Art Afshar, president of Micro Express, which is using K6 in its desktop systems. "Depending on application, AMD K6 is faster in floating-point processing."

Tyan Computer's Adam Vener likes K6 performance but is taking a wait-and-see approach: "The K6 is performing as well as, and in most cases, faster than the Pentium, Pentium MMX, and Pentium Pro—except in CAD and 3D. That's where the Pro takes the lead. I might consider the K6, but the question I have is: Will my motherboard support it? Because of the newer voltages, which are different from equivalent Intel CPUs, it might be hard to convince me to buy K6 unless I'm assured of compatibility. This seems to be the number-1 factor in deciding on the CPU vendor. AMD has a lot of work to do to make everyone a believer."

Expect AMD to launch a K6 266MHz part by Q3 of this year, and a 0.25-micron 300MHz CPU by December. Does AMD even care about Slot 1? Dean Whitehair, an AMD product manager, says no: "We believe that we can do more with Socket 7, and we'll extend its life through 1998 and 1999. There is no advantage at all right now to Slot 1 when it comes to performance or pricing. We're seeing our customers having to redesign their motherboards for not that much more performance. We have plans to provide Socket 7 PCIsets with AGP, and eventually 100MHz PCIset. We want to provide features and ensure we're not locked out and dictated to by what Intel's going to do."

Cyrix 6x86MX: Trouble Brewing on the Silicon Knoll

Cyrix
6x86MX

While many have praised Cyrix chips as low-cost alternatives to Intel offerings, others have cursed Cyrix's 6x86 processor for not running some applications. To its credit, Cyrix maintains a web site filled with workarounds to problematic software. With MMX on every bootReader's hit list, the spotlight's now on Cyrix's latest gunman.

Cyrix's 6x86MX processor launches with three models—the 6x86MX-PR166, PR200, and PR233. But don't let the numbers fool you; they aren't the actual processor clock speeds. They are, according to Cyrix, "Pentium performance ratings." In reality, the PR166 operates at a 60MHz bus speed and a 150MHz core clock speed, and the PR200 cruises at a 66MHz bus speed and

Forensics Analysis: CPU bootMarking

From the Files of the bootCommission

Talk is cheap—you want the numbers. So we contracted a motherboard that worked with all three processors and ran a specially prepared set of real-world bootMarks. All Win95 bootMarks were run at 1024x768 at 64k colors. Because at press time Cyrix could only deliver a 6x86MX-PR200, we eschewed testing 233MHz processors from the other manufacturers for the sake of fairness. For the PR200, we enabled the L2 cache's Linear Mode, both on the motherboard and BIOS.

The bootMarks

CPU/Motherboard *Our own basic bootMark pokes and prods at the processor, cache system, and memory. For the bootMark score, we took the average of five runs of the test.*

Win95 Apps *BAPCo's SYSmark 32 for Windows 95 is a suite of script-based tests that gauge performance in office programs such as Microsoft Word, Borland Paradox, and Adobe PageMaker.*

DOS Gaming *id software's Quake—everyone's favorite floating-point processing hog. Using our bootmark.dem file, DOS Quake ran in pure DOS mode at 640x480 resolution in full-screen, no status bar.*

3D Acceleration *GLQuake is the center of attention here. Same as above, but performance was boosted with Diamond's Monster 3D 3Dfx card. The same parameters that applied in our DOS Gaming test apply here, except GLQuake ran in Win95.*

DirectX Gaming *Shiny's built-in MDK PerfTest program tests DirectX video-card speeds as well as processor performance.*

L1 Cache *We used CacheCHK to test L1 cache performance.*

DMA Speed *Using Rendition's DMATest, we checked how fast bus-mastered Direct Memory Access would be with the different processors.*

MMX Performance *Equilibrium MMX-enabled DeBabelizer Pro is the battleground for testing how fast each processor can apply a superpalette to an AVI file. This is the same benchmark we run on all our systems. We ran the benchmark three times and averaged the results to ensure no wild discrepancies.*

LightWave 3D *With NewTek's 3D rendering software, we used raytrace.lws, a number-crunching render that's often used to benchmark systems.*

Control System Configuration: OS *Windows 95 OSR/2* *Motherboard* *M-Tech R-534F w/512K L2 cache* *RAM* *32MB EDO-DRAM SIMMs* *Video* *Rendition reference board w/4MB EDO-DRAM, Diamond Monster 3D w/4MB EDO-DRAM* *Video Configuration* *1024x768/64K colors @ 75Hz* *Hard Drive* *Quantum Fireball 1.2GB EIDE* *CD-ROM* *Mitsumi FX-120T 12x CD-ROM EIDE drive*

Our Findings

Depending on the application, the Pentium killers either hit with unerring accuracy or pulled wide of the target. Our basic bootMark test had the K6 posting an incredible average of 81, besting the 57 the P200 MMX mustered. The 6x86MX also pulled ahead of the P200 MMX. Under BAPCo's Win95 application-intensive SYSmark32, the 6x86MX's attack struck home, posting the fastest scores of the three.

The upstarts' victories would be short lived, as DOS Quake unflinchingly exposed both processors' weaker floating-point power. The 6x86MX, in particular, ran a full 4.6fps slower than the P200 MMX. The K6 was also slack, posting slower scores than the P200 MMX, but not as slow as the 6x86MX. GLQuake benchmarking showed exactly the same pattern: Both AMD and Cyrix have a long road ahead before they get their floating-point processing to the Intel level.

Under our DeBabelizer Pro test, the K6 out-MMXed the Pentium with a faster processing time. While the difference ranged anywhere from five seconds and up, the times do not lie. But, when it came time for the 6x86MX to take aim, there must have been a dud in its magazine, because it was a full three minutes slower than the P200 MMX. This is not good. This is bad.

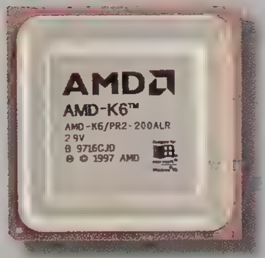
And Cyrix misfired again: The 6x86MX came in dead last in our LightWave 3D render—a full 11 minutes slower than the fastest CPU, the P200 MMX. The K6 faired better, coming in only two minutes later than the winner.

Our Conclusions

Compatibility issues aside, the K6 is competitive with the P200 MMX—depending on the application. It's faster running typical Win95 32-bit applications, but suffers in floating point—though not to the degree we witnessed with the 6x86MX, which proved a worthy assassin in SYSmark32 alone. We now believe the K6 acts alone in the plot to kill the Pentium.

PENTIUM KILLERS

⊕ —MARKS THE BEST PERFORMANCE IN EACH CATEGORY


AMD
AMD-K6™
AMD-K6/PR2-200ALR
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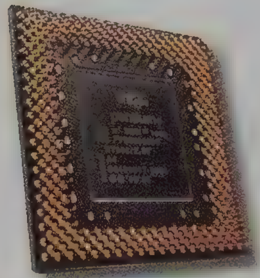
© 1997 AMD

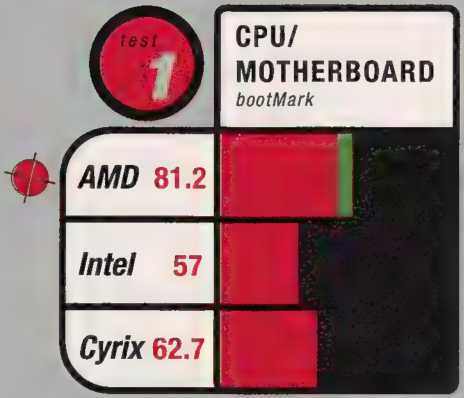
AMD K6-200MHz
Clock Speed 200MHz (3.0x multiplier)
System Bus Speed 66MHz
PCI Bus Speed 33MHz

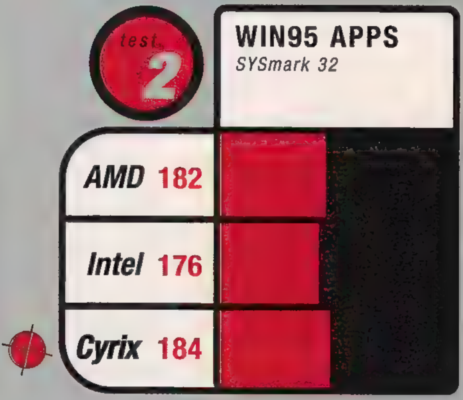


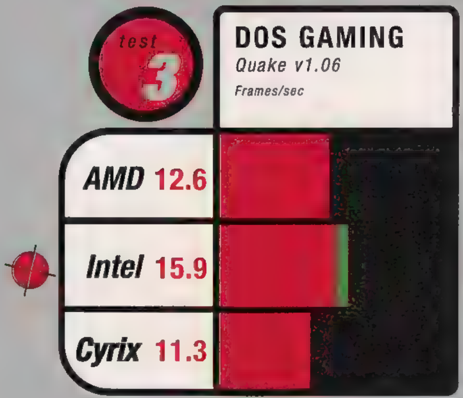
Intel Pentium 200MHz with MMX technology
Clock Speed 200MHz (3.0x multiplier)
System Bus Speed 66MHz
PCI Bus Speed 33MHz

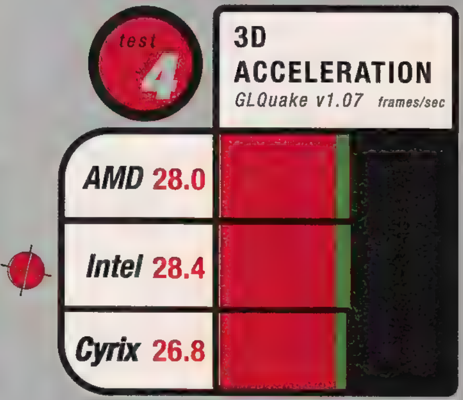
CYRIX CORP.
Cyrix
6x86MX
PROCESSOR
6x86MX-PR200
66MHz Bus 2.5x
2.8V
FAN/HEATSINK REQUIRED

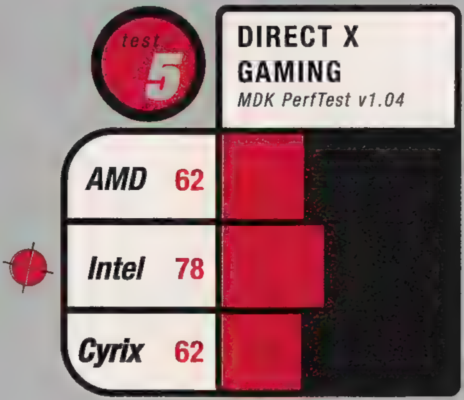
Cyrix 6x86MX-PR200
Clock Speed 166MHz (2.5x multiplier)
System Bus Speed 66MHz
PCI Bus Bpeed 33MHz

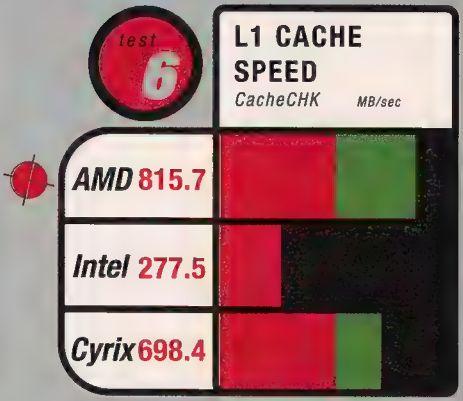


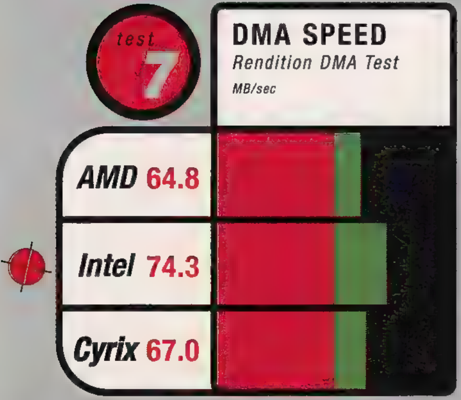


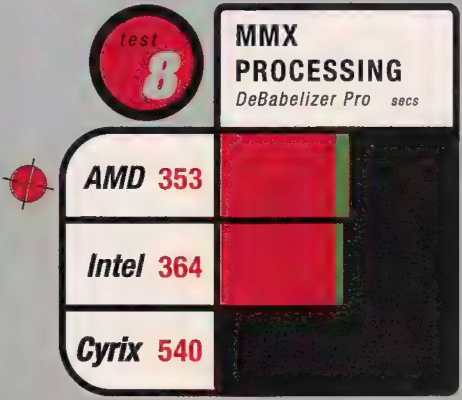


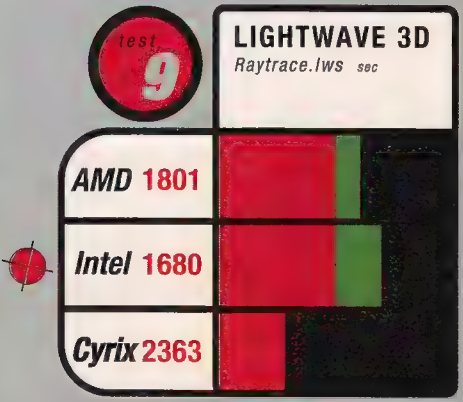












SEE PAGE 112 FOR A FULL EXPLANATION OF bootMarks a 166MHz core clock speed. The PR233 breaks that 66MHz barrier, blasting in at a 75MHz bus speed and a 188MHz core clock speed. This means you'll need a motherboard and PCIset that handle this higher clock speed.

The 0.35-micron, 6.0-million transistor 6x86MX ships with engineering already implemented in Intel's Pentium II. We're talking core processor architecture such as superscalar and superpipelined techniques, data-dependency removal, register renaming, multibranch prediction, speculative execution, and out-of-order execution. All are found in P-II, but not in Intel's Pentium processors with MMX technology.

One must also consider Cyrix's 64K unified L1 cache architecture, which differs from the typical 32K/32K split. Combining all of its nifty techniques with a faster 75MHz bus speed, Cyrix hopes to offset the fact that the 6x86MX-PR233 core doesn't run as fast as a Pentium 233MMX core.

Cyrix's mission with the 6x86MX is simple: "To bring performance into the mainstream," says Ajay Misra, Cyrix's product marketing manager. He cites Socket 7 motherboards as the clincher behind the decision to stalk Intel.

"Socket 7 motherboards are cost-effective," Misra says. "People know they can get a huge selection of motherboards that are available today, as opposed to the few vendors for Pentium II. You're going to see DVD-based 6x86MX systems for $1,800."

> "Intel is so strong. Both companies are basically going after Intel's leftovers."
>
> — Art Afshar, President, Micro Express

Cyrix is also challenging Intel's claim that AGP and Pentium II are intimately related. "Socket 7 boards are capable of doing AGP as well," Misra says. "It's a matter of when the chipset guys can provide AGP, and then running Memphis. We know the chipset and motherboard guys are planning to provide all this, so the way we look at it is: All the features that the Pentium II-class system has, we can provide—and cheaper, too."

These features will include Universal Serial Bus, RAMbus, and more. PCIset maker VIA has announced plans for its Apollo VP3 chipset, which will enable AGP on Socket 7 motherboards (see PCIset sidebar, page 49).

Developers: What Do They Know and When Did They Know It?

Considering everyone's coding for the Intel spec, do software developers care that AMD and Cyrix exist as viable alternatives? John Carmack doesn't think so. "Those processors are crap on floating point," says the id man. "The floating-point issue seems to have blindsided everyone but Intel."

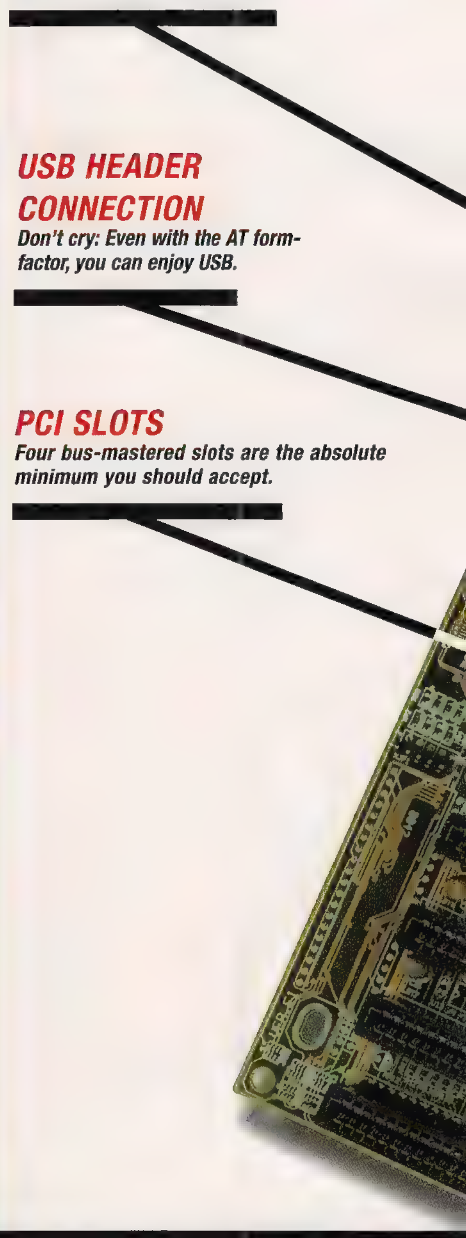
Others view the upstarts more favorably. "I have a K6-200 and have done a fair bit of benchmarking of our own apps and various renderers on it," says Digital Anvil's John Miles. "It's right around the Intel P5-200 performance level. Slightly faster for some things, slightly slower for others, but in no case noticeably different. It really blew me away that they're so competitive with Intel. The K6-200MHz can thrash the P-Pro 200MHz on certain tasks for which the P-Pro is poorly suited—for example, games that use the BUILD engine."

Like Carmack, Miles points to deficiencies in AMD floating-point performance: "The current K6-200's FPU performance could be better—it's fully 50 percent slower than a P6-200 running *Quake*," he says.

Most developers think AMD and Cyrix don't pose a serious threat to Intel—in Socket 7 or otherwise. "Although the specs for AMD and Cyrix chips look great on paper, we found their last generation of chips didn't perform as well with our games as native Intel machines," says Activision's Tim Morten. "I think it's very good for the market to have AMD and Cyrix nipping at Intel's heels, but for the time being, Intel still dominates the industry."

So what CPU would a big-time developer put in his own ultimate computer?

"Well, it depends," Carmack says. "For big server tasks, a quad Pentium Pro is the best value for the money. Pentium II systems are only available in duals at the moment. 3Dfx doesn't work as well with P-Pro/P-II class CPUs because of issues with programmed IO, so for many games a P200 MMX with a 3Dfx is still the best



SIMM/DIMM SLOTS
If your PCIset supports lot of RAM, it will behoove you to find a motherboard that has at least four SIMM slots and two DIMM slots. The more, the merrier.

USB HEADER CONNECTION
Don't cry: Even with the AT form-factor, you can enjoy USB.

PCI SLOTS
Four bus-mastered slots are the absolute minimum you should accept.

M-Tech Mustang R534F

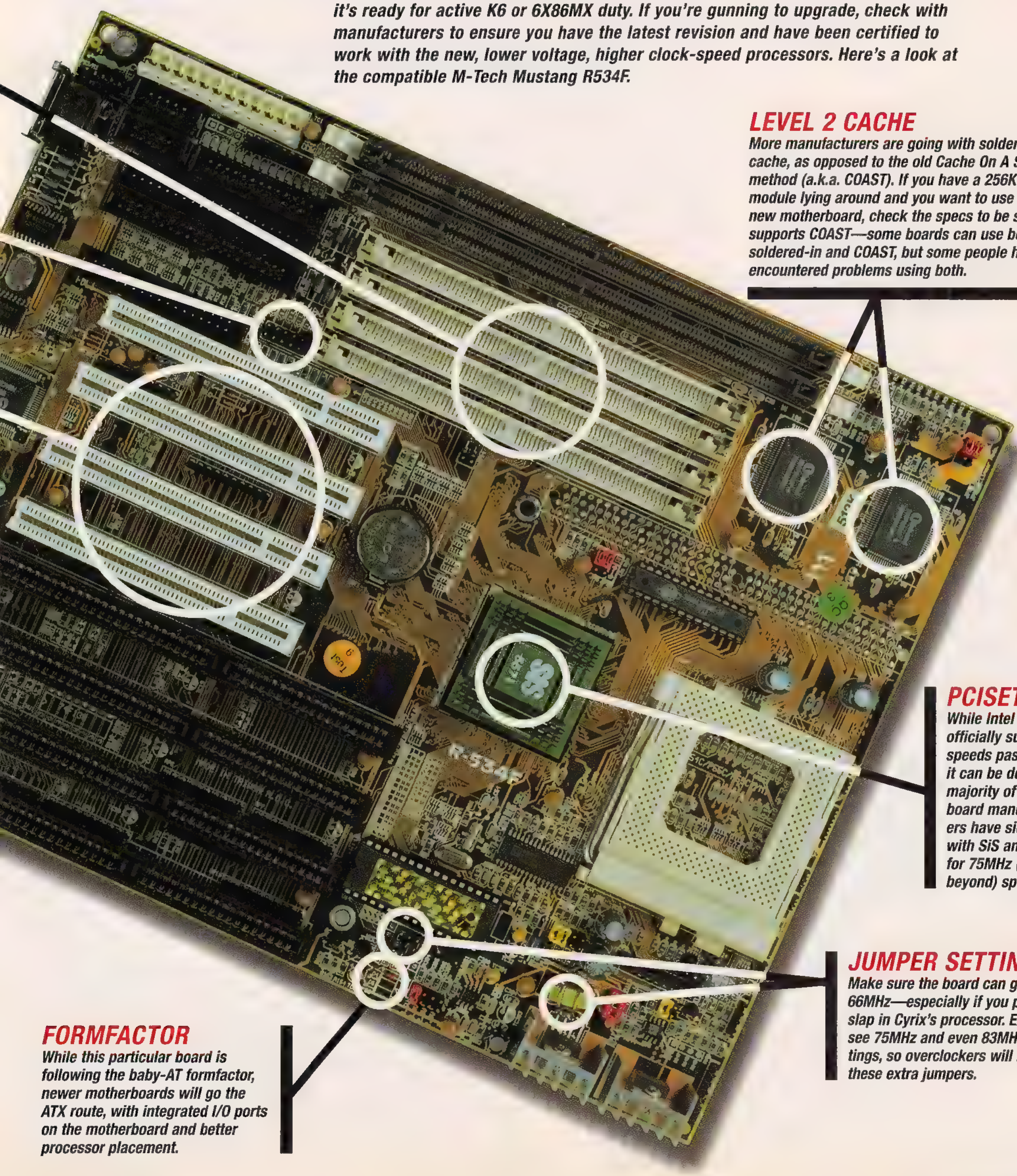
CPUs Supported Intel MMX, Cyrix 6x86MX, AMD K6, and a host of Pentium-level chips from each manufacturer
PCIset SiS 5571
Formfactor Baby AT
L2 Cache 512K soldered on pipeline burst
Expansion Slots Three PCI, three ISA, one PCI/ISA shared
RAM Slots Four SIMM, two DIMM
Maximum Memory 384MB
Clock Speeds 50, 55, 60, 66, 75, and 83MHz

Phone 408.441.8818
URL www.mtiusa.com

The Socket 7 Motherboard

Preparing your system for AMD and Cyrix parts

If you bought a motherboard within the last couple of months, there's a good chance it's ready for active K6 or 6X86MX duty. If you're gunning to upgrade, check with manufacturers to ensure you have the latest revision and have been certified to work with the new, lower voltage, higher clock-speed processors. Here's a look at the compatible M-Tech Mustang R534F.



LEVEL 2 CACHE

More manufacturers are going with soldered-in L2 cache, as opposed to the old Cache On A STick method (a.k.a. COAST). If you have a 256K COAST module lying around and you want to use it with a new motherboard, check the specs to be sure it supports COAST—some boards can use both soldered-in and COAST, but some people have encountered problems using both.

PCISET

While Intel doesn't officially support speeds past 66MHz, it can be done. The majority of motherboard manufacturers have sided with SiS and VIA for 75MHz (and beyond) speeds.

JUMPER SETTINGS

Make sure the board can go past 66MHz—especially if you plan to slap in Cyrix's processor. Expect to see 75MHz and even 83MHz settings, so overclockers will love these extra jumpers.

FORMFACTOR

While this particular board is following the baby-AT formfactor, newer motherboards will go the ATX route, with integrated I/O ports on the motherboard and better processor placement.

bet. For boards that use DMA, or for software-rendered games, a P-II will be the best performer."

Forensics Report: The bootCommission

OEMs and code jockeys can theorize all they like, but if you want indisputable evidence, don't trust any source but The bootCommission, a specially appointed set of benchmarks designed to investigate the plot to kill the Pentium. Go to page 44 for full benchmarking analysis, but read on for the synopsis.

After intense scrutiny, we concluded that the AMD K6 processor comes out as the more accurate gunman, meeting or besting the P200 MMX in almost every benchmark category. While floating-point processing on the K6 is slower than the P200 MMX by a couple of frames in *Quake*, the difference is negligible in *GLQuake.* K6's Win95 performance is much faster, actually inching by the P200 in our MMX performance benchmark. Overall, the K6 is a very compelling alternative to the Intel regime.

Cyrix, on the other hand, needs to practice its aim. The 6x86MX-PR200 did come in first in one test: Win95 performance. While it bootMarked faster, and posted superior L1 cache speeds than the P200, the 6x86MX missed wide in most other tests, coming in dead last in *Quake* performance, DirectX benchmarking, MMX processing, and *LightWave 3D* rendering.

Does this mean you should go out and contract a second gunman? Not necessarily. Only Intel can guarantee 100 percent compatibility with all PC software: When writing code, some developers use a specific CPUID command that looks for the "genuine Intel" flag rather than checking for the presence of MMX. Programs that use this tag will inevitably crash on a K6 or 6x86MX—a prime example is Sega's *Virtual On.* Also, if floating-point performance is imperative to your marching orders, stick with the Pentium's domestic policy.

THE LINE UP

Cyrix
6x86MX
6x86MX-PR200
FAN/HEATSINK REQUIRED
AMD
AMD-K6

Détente in the New World Order

Pentium II's Single Edge Contact cartridge is poised to create a monopolistic new world order for PC processor interfaces. Yet, like an arms dealer who finds lucrative sales in ammo for yesterday's weaponry, Cyrix finds comfort in the past. "Intel has built an infrastructure for the Pentiums," says Robert Maher, Cyrix's vice president of engineering. "Intel has put all this money into the processor, and now we're reaping the benefits. There are lots of P60/P90s out there, and [consumers are] going to be upgrading."

With Cyrix ramping up volume manufacturing in Q3 of this year, releasing a 266MHz processor in Q4, and preparing to enter the 300MHz arena with a Socket 7 0.25-micron processor, the ZIF is far from dead. And who's to say Slot 1 will be an unstoppable success? "Look at Microchannel with IBM, and VESA Local Bus," says Art Afshar, president of Micro Express. "People are hesitant to move into new technologies."

Are There More Than Two Gunmen?

While the battle for Socket 7 dominance rages between the three major processor players, other manufacturers have announced plans to bring x86 CPUs to the battlefield.

Centaur Technologies *plans to unload a Pentium MMX-level processor, the ITC-C6, in mass volume this August, with full-steam production of the chip by March 1998. Coming in at 150MHz, 180MHz, and 200MHz clock speeds, a 233MHz processor is also in the works. The ITC-C6 uses a RISC-like architecture that's optimized for highly used instructions, but what makes this processor unique is its low power draw: A 20Hz ITC-C6 pulls about 10.6 watts compared to the 15.7 watts pulled by an Intel P200 MMX. Centaur Technologies plans to brutalize Intel with $100 per-part bulk pricing for its 200MHz chip (Intel comes in at $550 for a comparable chip and pricing structure). The 64K of unified L1 cache, and MMX in a small 88mm2 CK, 0.35-micron die cast will make this CPU one to watch.*

Centaur ITC-C6

Digital's *Alpha 21164PC microprocessor, while not x86 compatible without FX!32 translation, is aimed at snatching NT users with a combination of RISC processing and faster clock speeds—all within the price range of comparable Pentium Pro/Pentium II. With an 8K data cache, 16K of instruction cache, and support for up to 4MB of off-chip L2 cache, the 21164PC will include its own version of multimedia extensions, Motion Video Instructions (MVI), aimed specifically at accelerating MPEG-1 and MPEG-2 video. The processor will run at 400MHz, 466MHz, and 533MHz CPUs and sell for $295, $395, and $495 respectively in quantities of 1,000.*

National Semiconductor's *forthcoming N7, while not armed with MMX, comes in to attack Intel from another angle—the low-cost CPU. While the processor will most likely max out at 133MHz, it will cost no more than $30 in bulk. This processor, along with Cyrix's MediaGX, will keep entry-level system builders busy designing NetPCs and network computers based around Intel architecture.*

Socket 7 PCIsets

Intel Catches Flak on Another Front

The plot to take down Intel isn't limited to the CPU theater: PCIset makers who've lived under the Cold War shadow of Intel's 430PCIset regime are now gearing up their war machines. Here's a rundown of the latest Socket 7 chipsets and what to expect down the line. Note that while some manufacturers don't officially support higher clock speeds past 66MHz, careful inspection of motherboards will yield surprises, such as 430TX-based boards that support 75MHz. If you're in the mood for overclocking, this is your ticket.

PCIset	The Goods	Maximum RAM	Maximum L2 Cache	Maximum Cacheable RAM	RAM Support	Maximum System Bus Speed	Maximum PCI Bus Speed	AGP Support	USB Support	Number of CPUs Supported	Ultra DMA/ATA-3 Support
Intel 430TX	Intel's fifth-generation (and last Socket 7) PCIset is found in more motherboards than all other PCIsets combined. Still, other chipset manufacturers, eager to own a piece of the game, are out-engineering Intel on almost every feature.	256MB	512K	64MB	SIMM/DIMM (FP, EDO, SDRAM)	66MB	33MHz	No	Yes	One	Yes
AMD 640	AMD's close alliance with VIA has produced a PCIset capable of challenging the mighty Intel. Naturally engineered to match the K6, AMD may find many motherboard manufacturers siding with its PCIset, thanks to impressive features. (This set was previewed in boot 09.) Expect an AGP-compliant part by Q3 of this year and a 100MHz part by years end.	512MB	2048K	512MB	SIMM/DIMM (FP, EDO, SDRAM)	66MHz	33MHz	No	Yes	One	Yes
ALi Aladdin IV+	Usually seen in older 486 motherboards and on Acer Computer motherboards, specs for the lower-cost ALi Aladdin IV+ PCIset include faster system bus speeds, lots of RAM, a hefty L2 cache, integrated Super I/O interface, distributed DMA, and more. ALi's next generation Aladdin V PCIset will be AGP enabled.	1GB	1024K	512MB	(FP, EDO, SDRAM)	83.3MHz	33MHz	No	Yes	One	Yes
OPTi Vendetta 82C750	Yet another chipset manufacturer that was almost buried when Intel entered the market. This highly integrated, single-chip solution can handle UMA and non-UMA system configurations, as well as a bevy of 430TX ass-kicking features. The 512K of L2 cache may not pack the piercing power of other PCIsets.	512MB	512K	512MB	SIMM/DIMM (FP, EDO, SDRAM)	66MHz	33MHz	No	Yes	One	Yes
SiS 5571	A popular non-Intel alternative, SiS has been making chipsets for quite some time, and its latest 5571 is no slouch in terms of feature sets.	512MB	1024K	512MB	SIMM/DIMM (FP, EDO, SDRAM)	83MHz	33MHz	No	Yes	One	No
VIA Apollo VP2/97	While VIA may not have Intel's marketing muscle, it has enjoyed a fanatically loyal customer base that swears by the Apollo PCIset. It may be harder to find than most chipsets, but it may be worth the trouble.	512MB	2048K	512MB	SIMM/DIMM (FP, EDO, BEDO, SDRAM)	83MHz	33MHz	No	Yes	One	Yes
VIA Apollo VP3:	This new chipset will AGP-enable forthcoming Socket 7 motherboards, so 64-bit superscalar processors from IDT, AMD, and Cyrix can get down and dirty with the faster graphics Intel thought would only be possible on the Pentium II. The PCIset will conform to the PC 97/98 spec, and will enable concurrent AGP and processor access to memory, thanks to the DRAM controller. The part is sampling now to motherboard manufacturers and will ship in volume for $39 in Q3 of this year.	1GB	2048K	1GB	SIMM/DIMM (FP, EDO, SDRAM)	83MHz	33MHz	Yes 33MHz, 66MHz, and 133MHz	Yes	One	Yes

But how will AMD and Cyrix deal with the unenviable task of cloning Slot 1?

Ajay Misra says, "There are several options. One is to come up with something identical. Another option is to get together with other x86 vendors and create another slot."

An intriguing concept. If enough x86 developers—say, AMD, Cyrix, ITC, and National Semiconductors—get together and work toward a new, unified Slot 1-esque standard, who knows what great performance increases they could accomplish. Who says Intel has to be the only superpower? ▯

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- 2.1 GB EIDE Hard Drive/1.44 MB Floppy Drive
- Metabyte Gia 3D with 4MB EDO RAM(S3ViRGE)
- Yamaha Sound System
- 104 Win95 Keyboard & Mouse
- Mini-ATX CASE with 235 Watt Power Supply
- Microsoft Windows 95
- Monitor Sold Separately

MGPX166 $985

MGPX200 Featuring:

- Intel 200MHz Pentium® Processor with MMX™ Technology
- Intel TC430 HX Motherboard with 512K cache
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- 2.5 GB EIDE Hard Drive/1.44 Floppy Drive
- S3 ViRGE 3D with 4MB EDO RAM
- Yamaha Sound System (OPL3 Driver)
- 16X CDROM
- NEC 15" Monitor (viewable size 13.8")
- Mini-ATX CASE with 235 Watt Power Supply
- PS/2 Keyboard & Mouse
- US ROBOTIC 56K Modem
- Microsoft Windows 95
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MGPX200 $1,985

MMX™
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MEDIA ON

Product Information Number 236

MOBILE COMPUTING

So your ride is a '66 AMC Marlin hooptie. Big deal. It's 1997, and mobile silicon makes the man. With more than $22,000 worth of circuitry onboard, you're ready for an FTP session or game of Interstate '76 at any random longitude. Simply follow your GPS, and don't forget to lock your gear in the trunk when you hit the streets of San Francisco.

Cross Townsend *Complement your PalmPilot with the ultimate polymeric stylus. Ultrafine particles of lapis lazuli are applied to the pen's brass shell, and then 22-carat gold flake is suspended in the finish before clear lacquer is applied on top. $350, www.crossusa.com*

Panasonic CF-62 *With a PD rewritable optical drive hiding underneath the keyboard, the CF-62 is the notebook for double-naught spies who need to store secrets on the thinnest of discs, and then drop them off in bus-station lockers. Guts include a 133MHz Pentium, 1.35GB hard drive, 16MB RAM (80MB max), and 12.1-inch active-matrix color LCD display protected by a magnesium alloy lid. $7,200, www.panasonic.com*

Sierra AirCard *CDPD IP protocol gives you 19Kbps net access directly through the world's cellular networks; in tethered "wireline" mode you can enjoy 33.6Kbps. Best of all, using your notebook's multimedia capabilities, you can turn your machine into a cellular speakerphone. A very thin cellular PC card solution. $895, www.sierrawireless.com*

Twiddler *"Note to self: Buy this one-piece mouse/keyboard combo so I can type more notes to self while driving with one hand." The Twiddler uses chord keying, which requires pressing one or more keys at a time (combos of 12 finger keys and six thumb keys emulate 101 standard keyboard buttons). [illegible] www.hand[illegible].com*

PalmPilot *Let's get small with boot's favorite PDA. Tiny enough to fit in your breast pocket and weighing just 5.7 ounces, this revolutionary dynamo packs a Dragonball 68328 processor, 1MB of memory, and 160x160 backlit monochrome screen. The memory is more than enough for scores of razor-thin third-party apps you can download via a serial connection. The Graffiti handwriting-recognition software is so incredible, you'll never use the on-screen keyboard. $399, www.usr.com*

PHOTOGRAPH BY LEIGH BEISCH

Takin' it to the Streets

Compass Navigation System Using the Eagle Explorer Global Positioning Receiver, the Compass software shows you exactly where you're located on street-level maps of the United States. It's all a matter of reading signals from up to 12 of the 24 GPS satellites bobbing in the atmosphere, and then triangulating your precise position. $339, www.chicagomap.com

Ricochet Wireless Modem As long as you're in an area that hosts Metricom ISP transceivers (Washington D.C., the San Francisco Bay Area, Seattle, and 10 major U.S. airports), you can enjoy untethered Internet access via the Ricochet at practical speeds of up to 28.8Kbps. Transceivers are typically placed on street lamps every half mile from each other—look for these shoebox-size devices to come to a town near you. $10 monthly modem rental, $29.95 monthly unlimited [illegible]

Fujitsu LifeBook 655Tx Goodbye Fat Albert, hello Iceberg Slim. The LifeBook is pimp-skinny and only 4 pounds 7 ounces, but packs a 150MHz Pentium MMX processor, 16MB of EDO DRAM (80MB max), 1.3GB hard disk, and bright 12.1-inch TFT LCD screen. $3,999, www.fujitsu-pc.com

Fieldworks FW5000 It's the Hummer of electronic toolboxes. Armaments include a 166MHz Pentium, 1.3GB hard disk, 16MB RAM (128MB max), 10.4-inch active-matrix color display, and four expansion bays. The real story, however, is the unit's magnesium and rubberized cabinet which can withstand extreme temperatures and shocks of more than 100 Gs. So no big deal if you hitch it to your bumper and drag it. $6,995, 888.343.53

Nokia 9000 Judy Jetson will dig any cat who packs this cell phone/PDA powered by an Intel 24MHz 386 and 6MB of memory. The 640x200 grayscale LCD displays all the usual organizer apps plus short alphanumeric messages, e-mail, and HTML, which you can send and receive via a digital network (use serial cable, R, and 2MB of storage for bigger files). [illegible], www.nokia.com

Tumi Safecase Hiding a patented shock-absorbing suspension system in a shell of Napa leather, the Safecase uses two elastic neoprene slings to protect notebooks from falls of up to 30 inches. With easy-access pouches for battery packs, cabling, and scores of essential widgets, the bag is the ultimate in carry-on luggage. $495, 908.27[illegible]5500

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"sensible interaction" • "beautifully rendered"
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Product Information Number 183

Live from PC Expo in New York

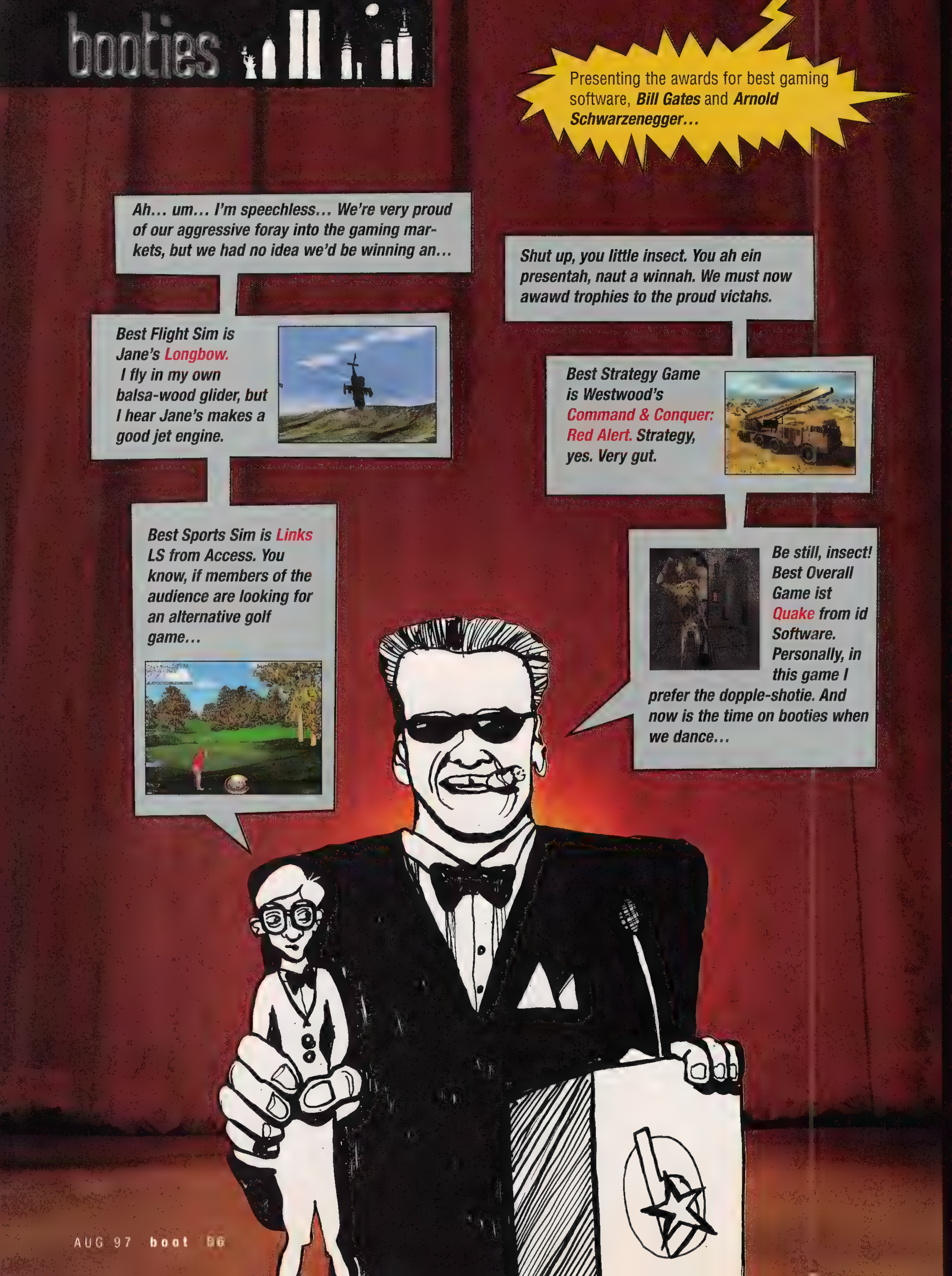
THE 1997 ANNUAL bootie AWARDS

*...and now, your host for tonight's festivities, boot Editor in Chief, **Brad Dosland.***

Good evening, fellow PC fanatics, and welcome to New York City, PC Expo, and the 1997 Annual bootie Awards. You've voted for your favorite PC products of the last 12 months, casting ballots on bootNet with passion and fury. Now it's our turn to release the names of the gear you deemed most bootielicious. We first present the award for Most Significant New Technology to… 3D Accelerators!

Yes, faster CPUs and DVD are sexy too, but only a 3D card can let you benchmark silicon with your very own eyes. Keep reading boot as we continue in our role as the number-one supporter—and critic—of 3D hardware technology.

OK, folks, get out your digital cameras, because tonight we've got a planeload of celebrities from the West Coast who will be presenting awards. Without further ado, let the ceremonies begin…


Presenting the awards for best gaming software, ***Bill Gates*** and ***Arnold Schwarzenegger…***
Ah… um… I'm speechless… We're very proud of our aggressive foray into the gaming markets, but we had no idea we'd be winning an…
Shut up, you little insect. You ah ein presentah, naut a winnah. We must now awawd trophies to the proud victahs.
Best Flight Sim is Jane's Longbow. I fly in my own balsa-wood glider, but I hear Jane's makes a good jet engine.
Best Strategy Game is Westwood's Command & Conquer: Red Alert. Strategy, yes. Very gut.
Best Sports Sim is Links LS from Access. You know, if members of the audience are looking for an alternative golf game…
Be still, insect! Best Overall Game ist Quake from id Software. Personally, in this game I prefer the dopple-shotie. And now is the time on booties when we dance…

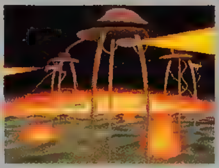
Presenting the awards for best general software, ***Lucy Lawless*** and ***Alex St. John…***

I'm honored to be here tonight, Alex. I come in peace as a humble defender of all boot readers, and wish only the best for the Clan of St. John, and all APIs that emanate thenceforth.

Thanks much, Lucy. I too come in peace, and just want to say I'm a big fan of Xena, and think all the TV shows that are competing in your time slot are horribly broken shows that should just whither away and die.

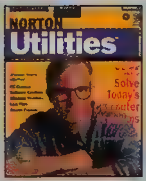
Best Graphics Program is Adobe Photoshop 4.0. Perfect for covering up stray body parts.

Best 3D Software is 3D Studio Max from Kinetix. I used my copy to make a 180,000-polygon club sandwich with avocado.

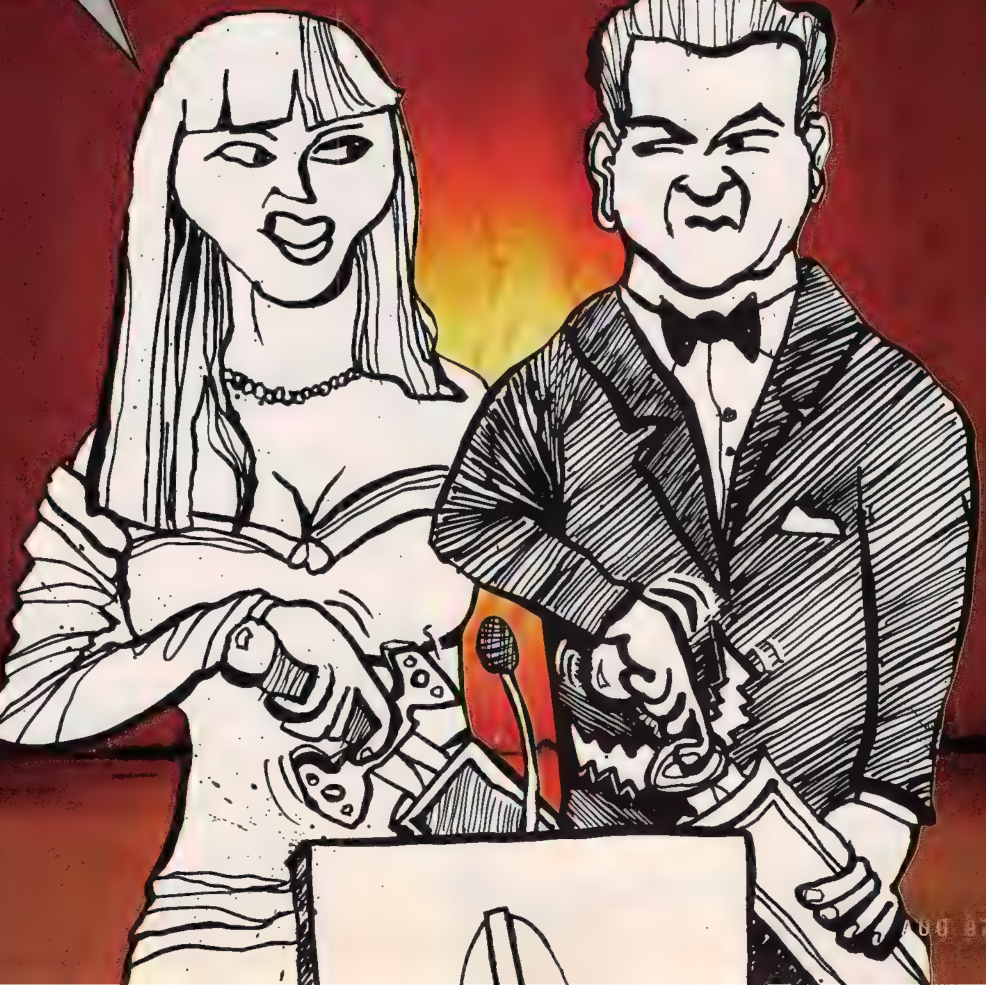


FrontPage97

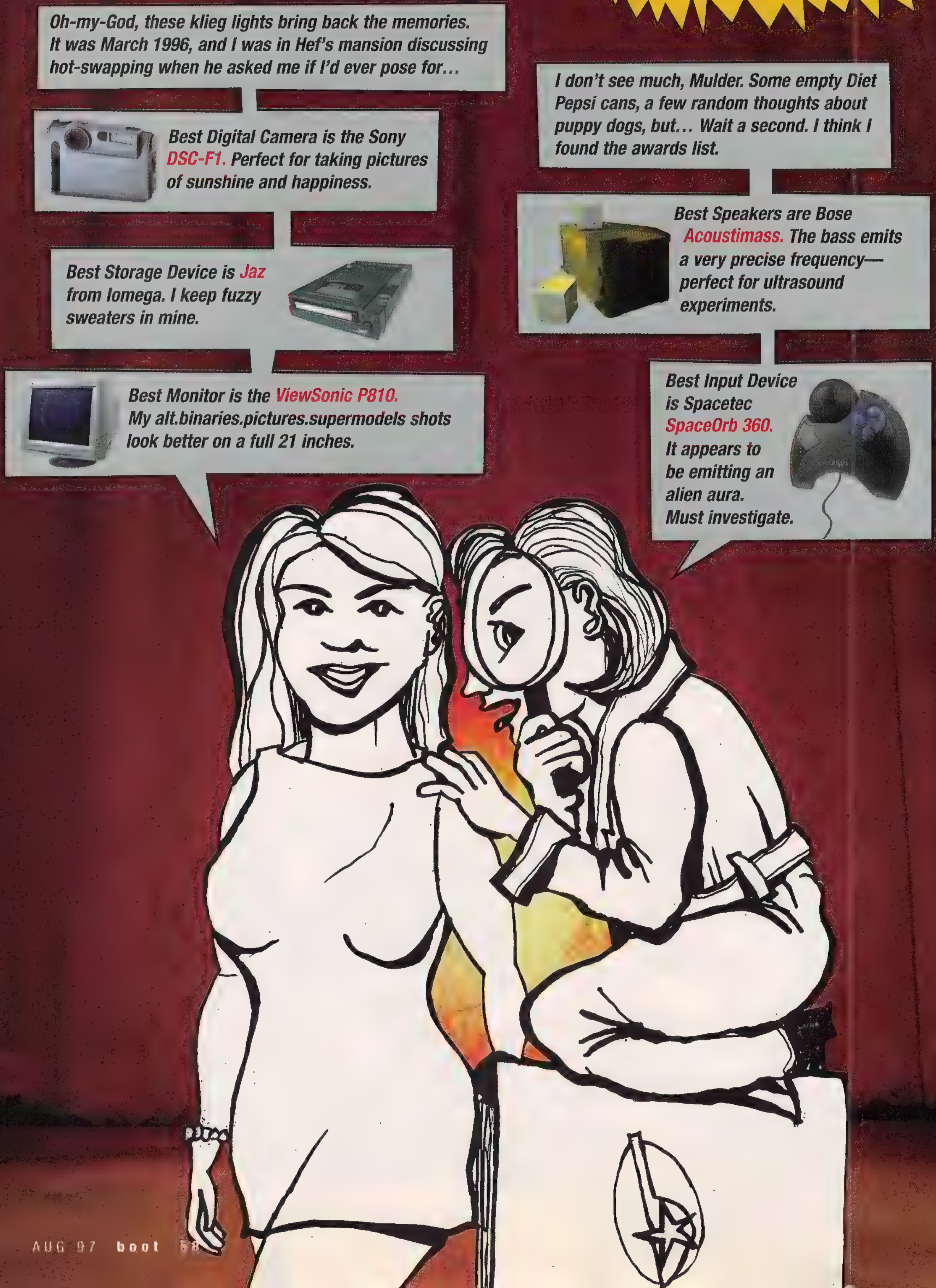
Best Web Authoring Tool is Microsoft FrontPage. I've got a spicy Gabrielle fan site in the works as we speak.



Best Utility Software is Norton Utilities from Symantec. Move over, broadsword, you're getting a little buddy on the tool belt.



Presenting the awards for best hardware peripherals, **Gillian Bonner** and **Gillian Anderson**…


Oh-my-God, these klieg lights bring back the memories. It was March 1996, and I was in Hef's mansion discussing hot-swapping when he asked me if I'd ever pose for…
Best Digital Camera is the Sony DSC-F1. Perfect for taking pictures of sunshine and happiness.
Best Storage Device is Jaz from Iomega. I keep fuzzy sweaters in mine.
Best Monitor is the ViewSonic P810. My alt.binaries.pictures.supermodels shots look better on a full 21 inches.
I don't see much, Mulder. Some empty Diet Pepsi cans, a few random thoughts about puppy dogs, but… Wait a second. I think I found the awards list.
Best Speakers are Bose Acoustimass. The bass emits a very precise frequency—perfect for ultrasound experiments.
Best Input Device is Spacetec SpaceOrb 360. It appears to be emitting an alien aura. Must investigate.

Presenting the awards for best systems and system components, **Courtney Love** and **John Romero**…

Pain. Agony. Insanity. PCI. AGP. ISA. ViRGE. Crap. Mystique. Crap. Why does USB torment me in the night? Why does USB torment me in the night?

That's my latest poem. I call it "Fresno Heroin Crash." Love it or go to hell.

Best 3D Accelerator Card is the Diamond Monster 3D with 3Dfx. Whatever. Give me six shots of Jaegy, and I'll texture-map your carpet.

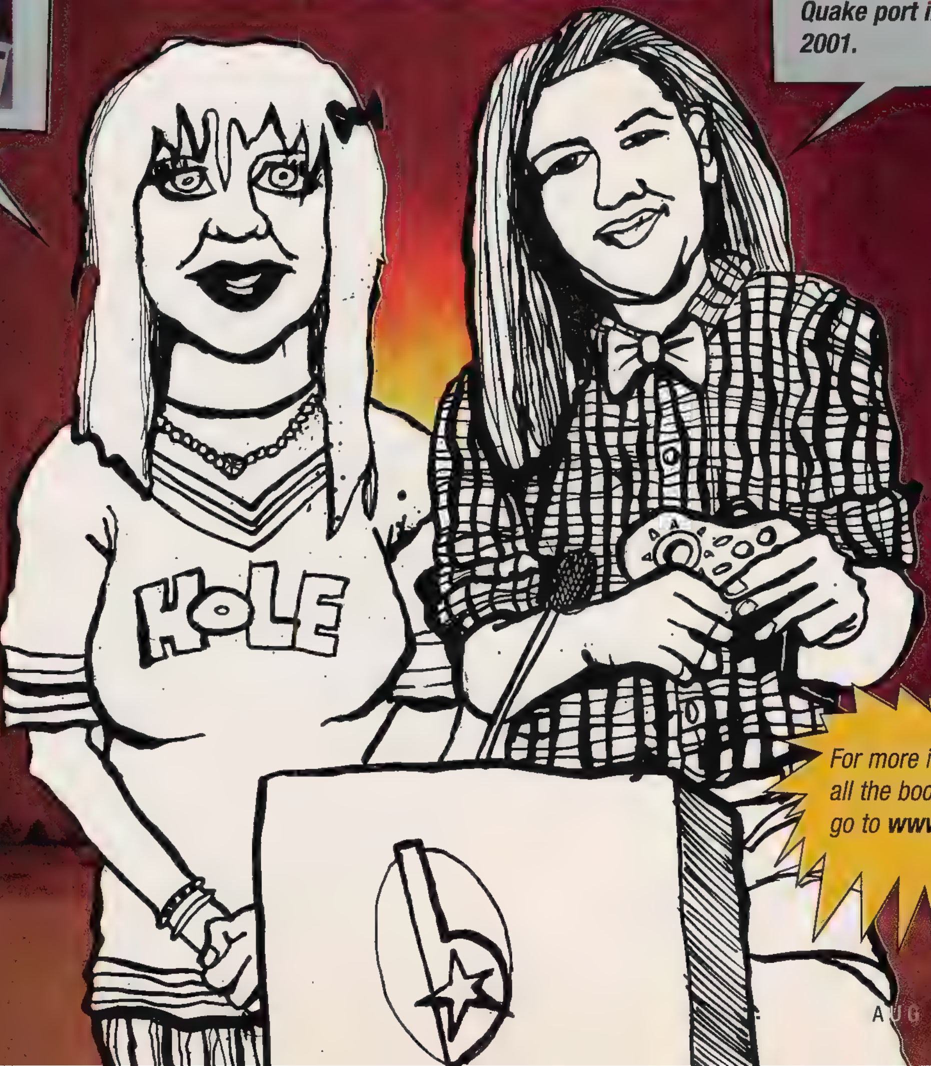
Best Desktop System is the Gateway 2000 G6-180. It's fully loaded—like me, Courtney friggin' Love.

Best Notebook is the IBM ThinkPad 760E. I ate mine, component by component, in a three-week binge in Houston.

Umm… They told me I wouldn't have to dress up. They said flannel's cool. They told me I wouldn't have to dress up.

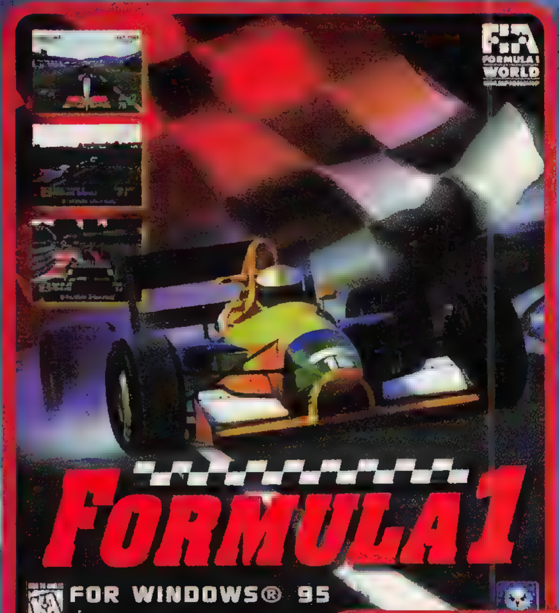
Best Sound Card is Creative Labs AWE64 Gold. I run mine through a stack of Marshalls.

Best PDA is the U.S. Robotics PalmPilot. Expect a Quake port in 2001.



For more information on all the bootie Award winners, go to **www.booties.com.**

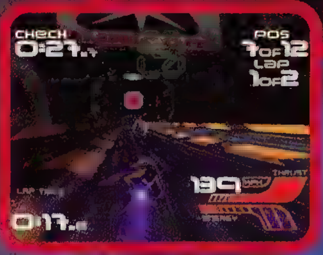
ACCELERATE



FIA FORMULA 1 WORLD CHAMPIONSHIP
FORMULA 1
FOR WINDOWS® 95
3D ACCELERATION REQUIRED

WIPEOUT XL
FOR WINDOWS® 95
PSYGNOSIS

BEST TIME
LAP TIME



CHECK
POS
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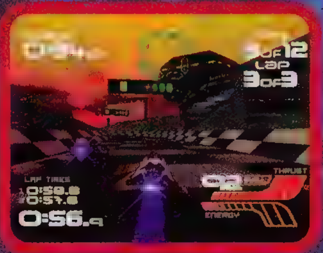
THRUST

5 HERBERT 2 BENETTON RENAULT
FINISH LINE
TAG HEUER Official Timing



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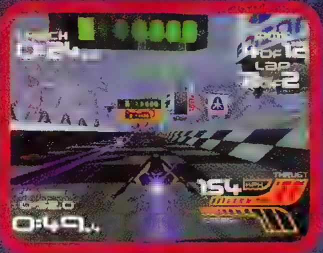
THRUST
ENERGY

1 ALESI FERRARI
THIS LAP
TAG HEUER Official Timing



CHECK
LAP
THRUST

Wipeout XL and Formula 1. The most blistering 3D arcade race experiences available for the PC, coded specifically for the explosive graphics processing power of today's hottest 3D accelerator cards. Packed with all-action features, they represent the ultimate synergy of gameplay and design. No other games are optimized to get more razor-sharp graphics from your 3D accelerator card. So strap in, and see if you can keep the pace.

Cutting-edge 3D graphics supported by the following cards.

WIPEOUT XL
- Video Logic Power VR
- 3DFx Card
- 3D Labs Permedia
- Rendition Verite
- ATI Rage Mk2

FORMULA 1
- Matrox Mystique
- 3DFx Card
- 3D Labs Permedia
- Rendition Verite

Check out downloadable demos and quick time videos at www.psygnosis.com

PC CD ROM

KIDS TO ADULTS
CONTENT RATED BY ESRB

PSYGNOSIS

CREATIONS

FIA FORMULA 1 WORLD CHAMPIONSHIP

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Product Information Number 279

DEALING WITH YOUR **PC OBSESSION**
DAY TO DAY BY BREAKING IT DOWN
INTO 12 **EASY** STEPS

Installing Three Kick-Ass 3D Accelerators in One System

Can't decide between 3Dfx, PowerVR, ATI, and Rendition? All four chips have made it into Kick-Ass cards, and all have unique features or featured games that make it oh-so-tough to choose. So why choose when you can have it all?

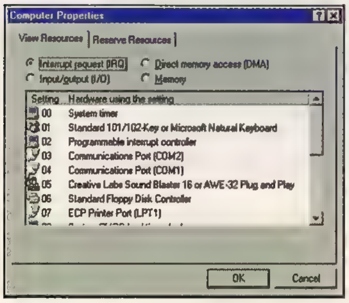
Well, OK, almost all. Windows (until Memphis' multi-monitor support) limits you to a single 2D graphics card, but there's no rule keeping you from heaping on the 3D-only accelerators. Just pick your favorite 2D/3D card and slap in both a PowerVR and a 3Dfx-powered texel thrasher, and you'll be driving the ultimate 3D system this side of SGI—and only boot *shows you how to do it.*

— Chris Dunphy

1

Check Your Box

Three 3D cards aren't gonna fit into a system with one free slot no matter what kind of mojo you work. Check your system to make sure you have three free PCI slots before going any further. Keep in mind that you'll be able to ditch your 2D card and may be able to fit an Apocalypse 3Dx into a shared PCI/ISA slot even if the ISA half is full. Also, double check the System Control Panel to make sure there are two free IRQs. (The 3Dfx doesn't consume an IRQ.) If you have an IRQ problem, consider disabling an unused serial port to free some space.



● Interrupt request (IRQ)
○ Direct memory access (DMA)
○ Input/output (I/O)
○ Memory

Setting	Hardware using the setting
00	System timer
01	Standard 101/102-Key or Microsoft Natural Keyboard
02	Programmable interrupt controller
03	Communications Port (COM2)
04	Communications Port (COM1)
05	Creative Labs Sound Blaster 16 or AWE-32 Plug and Play
06	Standard Floppy Disk Controller
07	ECP Printer Port (LPT1)

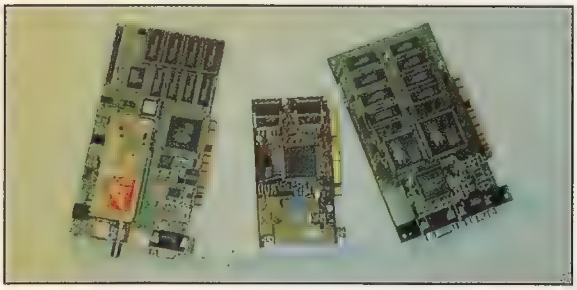
Click on Computer Properties in the System Properties control panel to view a list of your system's IRQs.

Our Ultimate 3D System

ATI All-In-Wonder	$285
Diamond Monster 3D	$199
Apocalypse 3Dx	$129 *(with $70 rebate)*
Total	**$613**

Our Cheapest 3D System

Your Current 2D Card	Free
Deltron Flash 3D	$149
Apocalypse 3Dx	$129 *(with $70 rebate)*
Total	**$278**



For our ultimate system we chose the ATI All-In-Wonder, VideoLogic Apocalypse 3Dx, and the Diamond Monster 3D.

2

Making Up Your Mind

Now you must decide which three cards you want to charge your system with. The VideoLogic Apocalypse 3Dx is the obvious choice on the PowerVR side, but avoid the x-less Apocalypse 3D–it doesn't do filtering! On the 3Dfx side you have three very similar cards to choose from. If money matters, the obvious choice is Deltron Technology's Flash 3D for only $149, but it doesn't come with bundled games (see the review on page 92). The most bundle for your buck comes with the Diamond Monster 3D, which is stuffed with software for $199. In between, the Orchid Righteous 3D has a medium-size bundle for a medium-size price of $179.

Your 2D/3D choice is less limited and you may want to stick with your current 2D-only card if funds are running low. But to cram the most features into the fewest slots, we suggest the ATI All-In-Wonder. This card rocks as a 2D accelerator and gives you great video-in and -out capabilities (plus it can turn your PC into a killer TV with its built-in tuner).

If maximum 3D coverage is your concern, go with a Rendition Vérité-based board. The clear performance leader of this bunch is the Canopus Total 3D—and it comes with nifty stereoscopic 3D glasses. But for this 12-Step we're going with ATI.

3

Get 'em Cheap

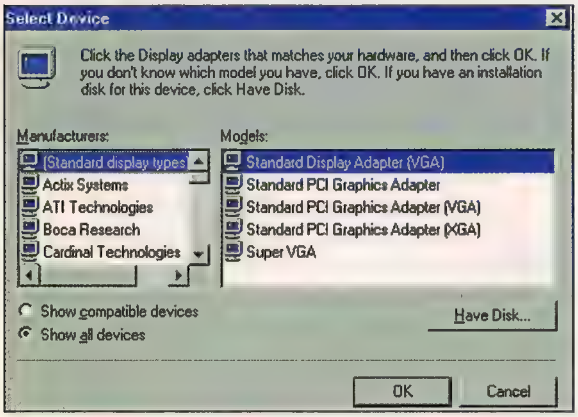
Here's a cost-saving tip: VideoLogic is so confident of its card's superiority, it has instituted a competitive upgrade for 3Dfx owners. Buy your 3Dfx card (any model, from anywhere), then call up VideoLogic with the serial number of your board and they'll sell you the Apocalypse 3Dx (including the full retail software bundle) for $129, saving you $70—and you get to keep your 3Dfx card, too!

4

Clean Out The Trash

In the Video Control Panel, change your graphics driver to Standard Display Adapter (VGA) and uninstall any display utilities or tools that came with your existing graphics card. You *should* do this before adding any new 2D accelerator, it greatly reduces the risk of Windows getting confused.

Also, make sure you have the latest drivers for your cards. Things change fast in the 3D world, and the latest releases can avoid a lot of potential headaches.



Select Device

Click the Display adapters that matches your hardware, and then click OK. If you don't know which model you have, click OK. If you have an installation disk for this device, click Have Disk.

Manufacturers:
- (Standard display types)
- Actix Systems
- ATI Technologies
- Boca Research
- Cardinal Technologies

Models:
- Standard Display Adapter (VGA)
- Standard PCI Graphics Adapter
- Standard PCI Graphics Adapter (VGA)
- Standard PCI Graphics Adapter (XGA)
- Super VGA

○ Show compatible devices
● Show all devices

It's a good idea to set your graphics driver to basic VGA before installing a new 2D card.

5

Adding ATI

Open the case, rip out the graphics card, and slap in the All-In-Wonder. ATI's driver installation is relatively painless, though you may have to select "Show all devices" rather than "Show compatible devices" to get the board to appear in the driver-selection window. Have no fear, it's not hard.

Continue once you have everything up and running with the resolution and color-depth of your choice. The Wonder will now be responsible for all 2D functions, including DirectX acceleration.

The All-In-Wonder crams a lot of goodies into a single PCI slot.

6

TV-In

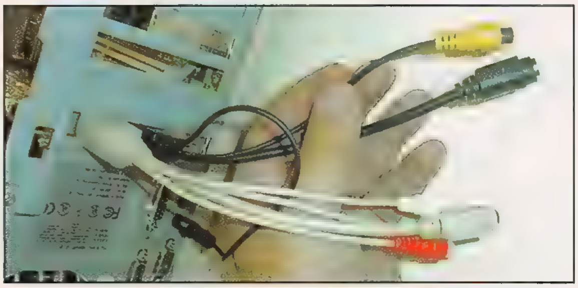
Now is a good time to check out the TV-tuner features of the All-In-Wonder. You'll be amazed at how cool TV on the PC can be (or you can use your camcorder as a surveillance camera with a monitor window on-screen).

The All-In-Wonder's TV-tuner features give your PC the power to replace your television.

7

TV-Out

Hook up the breakout cables to the All-In-Wonder, and use a composite or S-video cable to hook it up to the biggest TV you can find. Thirty-foot extension cables and an IR keyboard come in handy here. Hook up your home entertainment center speakers to your computer while you're at it. Then turn off all the lights, crank up the volume, and start *Quake*. Yow!



Use an S-video cable to hook the All-In-Wonder up to the biggest TV you can find.

DROWNED GOD
CONSPIRACY OF THE AGES
LISTEN TO YOUR EARS
BAZOOKA
To create the perfect sound for Horus, the Drowned God™ sound designers blew through an eight-inch plastic straw into the studio toilet and recorded it with a condom-wrapped microphone.
Of course, if you had a Bazooka, you already heard that.

Bazooka® MSE [illegible] subwoofer [illegible] you [illegible] things in the CD-ROM *Drowned God*™ you never he[illegible]
lows you simply can't hear with ordinary computer speakers. Call [illegible] he-Tube for your ne[illegible]er, [illegible]
enclosure makes. Then get ready for a subwoofer so [illegible] you'd swear it was revers[illegible] In Canada, call: Trends E[illegible]
[illegible], and Listen To Your Ears are [illegible] courtesy of EMG and Instape [illegible] and Instape. All [illegible].

Product Information Number 304

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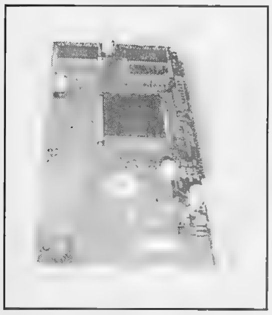
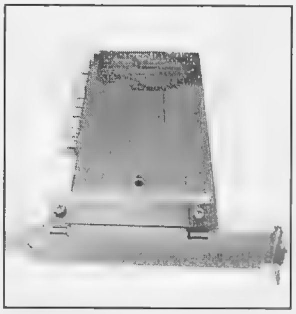
Companies listed above are 1996 Cattle Baron sponsors.

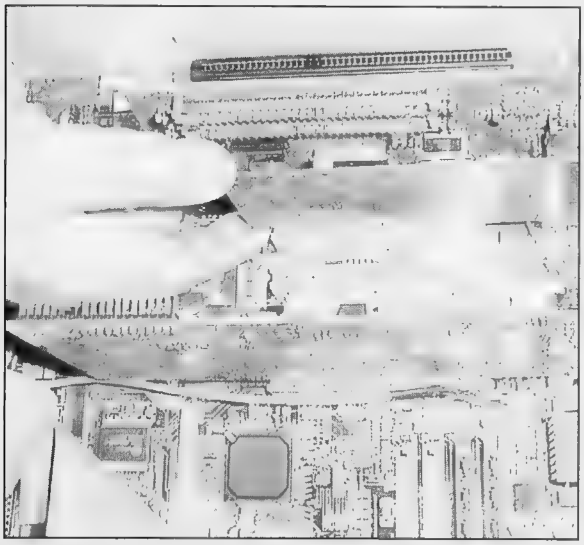
8

Shared Slot Sneak

The Apocalypse 3Dx is a tiny board, and since the PowerVR communicates over the PCI bus with your 2D card, it has no back-panel connections. If you unscrew the back panel from the 3Dx, you may be able to fit it into a shared PCI/ISA slot that already has the ISA half occupied. Talk about maximizing use of space!







Thanks to its incredibly small size and low profile, the Apocalypse 3Dx can reside in a partially occupied shared ISA/PCI slot.

9

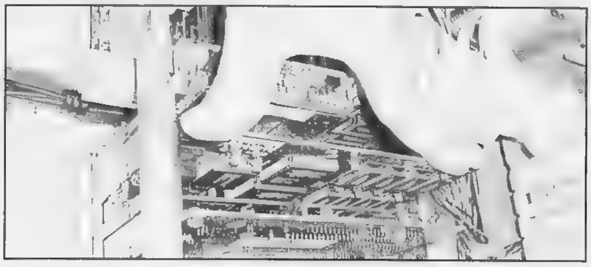
Feel The Power

Install the PowerVR drivers, and make sure things are working with a quick lap or two in *Ultim@te Race*. If the game moves in fits and starts, Plug-and-Play may have assigned the board a shared IRQ. Go into the System Control Panel and tweak until you get the 3Dx an IRQ of its own. Also make sure you can see PowerVR games through the TV-out of the All-In-Wonder—one very nice side-effect of sharing the 2D card's frame buffer.

10

3Dfx Looping

Power down and slap the 3Dfx card into your machine. Unplug the monitor from the ATI and plug it into the 3Dfx, then hook the ATI to the 3Dfx board with the provided short-patch cable. Now boot up, install the drivers, and make sure things are working by playing a quick round of *GLQuake*. Since the Voodoo chip doesn't share a frame buffer with your 2D card, the TV-out features of the All-In-Wonder are sadly bypassed, but the results on your PC monitor should be stunning.



This patch cable lets the 3Dfx take over the screen when it's ready to work its magic.

11

Direct3D Insanity

Now all three boards should be living somewhat happily in one machine. But it's a fine balance. Games written specifically for one board should work without any trouble, finding their desired hardware automatically, but Direct3D titles are a lot more complicated.

PowerVR has created a utility that docks into your taskbar and gives you the ability to toggle between 3Dfx, PowerVR, and your 2D/3D card with just a click. This utility then adjusts the Windows Registry to reflect your current preference, and the next time a Direct3D app starts, it will run where you want it to. We received a distributable copy of this tool too late to include it on the *bootDisc*, but it can be found on the *bootNet* in the Files section.

12

Play Ball!

OK, now you have The Ultimate Gaming System. So stop reading this, and get out there and start playing!

Eudora in Eu-Handa

I have a PalmPilot Professional and, although U.S. Robotics says *Eudora* isn't yet supported by the Mail application of PalmPilot Professional, I have it working!

These are the instructions:

1) In the *Eudora 3.0* program TOOLS/OPTIONS/MAPI menu, choose either "When Eudora is running" or "Always."
2) In the HotSync custom menu, activate Mail, and in the dialog box choose "Windows Messaging system 4.0."
3) Now HotSync! You'll have the In and Out folders of *Eudora* and the Pilot synchronized.

Known problems:

1) If you choose "Always" in *Eudora*, Exchange won't work. To avoid this, choose "When Eudora is running," and start *Eudora* before synchronization.
2) Every time there's a message to synchronize, *Eudora* starts a dial-up connection (if configured to dial up).
3) *Eudora*'s customized folders are not synchronized.

Guido Giangiacomo

Dual-Boot Devilry

In response to Dustin Zachary's plea for help [he was wondering why he couldn't get his machine to dual-boot in bootClinic, *boot* 09], his problem is caused by running Novell (DR) DOS 7. This DOS is unsupported by Win95 (a deliberate ploy by Microsoft?) as dual-bootable.

I had this problem, too. There are three ways to get around it:

1) Assuming you have dual-channel EIDE, install a second (or third) hard disk, configured as Master and bootable, on your secondary channel. Next, go into your BIOS, disable both drives on your primary EIDE channel, reboot your PC off the Novell DOS 7 install diskette, and install DOS 7 to the drive, which will now be seen as drive C: (check this carefully by first logging onto the drive and checking the contents). You can now boot into Novell DOS 7 whenever you want by disabling your other drives, but you won't be able to access data on the other drives.
2) You could repartition the primary drive on your current boot disk to contain two primary DOS partitions and an extended one (for storing data you want to access from both Novell DOS 7 and Win95). Make sure you do a good backup of everything first. Use FDISK to make the required boot partition active, then reboot your system. Once again, you won't be able to access data on the primary partition you have not booted off.
3) Boot off a Novell DOS 7 boot disk, load a RAMdrive large enough to contain the command.com, then copy it from the boot disk to the RAMdisk in your a:\autoexec.bat. Next, set the comspec=a:\command.com environment variable to point to the command.com on the RAMdrive. You can then remove the boot disk and work without getting the "Please insert disk with command.com in drive" message every time you exit a program.

Of course, you could always buy a copy of the inferior MS-DOS 6.22. Remember: DOS does not mean MS-DOS *all* the time.

Leigh Power

PCI Probe

In reference to *boot* 08's "What PCIset You Playin?": Most readers are unlikely to have Win95B (OSR/2) on their systems and, unfortunately, may be misguided by your tip. Neither the initial ".0" or ".0A" release of Win95 has the ability to recognize the VX or HX chipset, because the FX was the only one released at the time.

Terrence Walters

Interstate 6x86

My CPU is an IBM Cyrix 6x86L 150+, and Win95 OSR/2 reads it incorrectly. When I was installing the *Interstate 76* demo, I got a WARNING! sign saying that I have a 486 CPU. After installation, I had to set the game at low resolution in order to make it run more smoothly. Do I have a problem with my CPU, or do software companies stick to Intel Pentiums?

Ray Ofeciar

TECHNICAL EDITOR CHRIS DUNPHY REPLIES: *The Cyrix 6x86L is not 100 percent Pentium compatible, and in some ways is more like a 486. In other ways it owes its speedy performance to an architecture somewhat similar to the Pentium Pro. Cyrix's FAQ explains: "The 6x86 is a Cyrix-designed processor that has unique features that need to be enabled and used properly. Conversely, Cyrix does not support all Pentium routines."*

Though most software works just fine on a Cyrix, games can suffer if they haven't been tested and written to take the 6x86 into consideration. You should complain to Activision and ask for a patch that will work better with your CPU. Also, be aware that FPU-intensive games such as Quake *will never run really well on your machine; the floating-point performance of Cyrix's CPU just doesn't hold up to Intel. Read this month's cover feature for an in-depth report.*

Another Bug Hunt

I just slapped down $210 for a Screamin' 3D.

The first Rendition-ready game I tried was *IndyCar 2*, which comes bundled with the card. When I tried to run it, all I saw was snow. In a panic, I rushed to the Sierra site and downloaded the BIOS update, new drivers, and a diagnostic program. Still no luck. I have an Intel VX430 chipset, Cyrix P166+ (revision 2.5), and an ATAPI CD-ROM on the second channel. Doesn't the VX chipset support DMA bus-master mode? I have the latest bus master drivers from Intel. Do I have to change my CPU and/or my motherboard just to use this $210 video card?

ampac

> **"The Cyrix 6x86L is not 100 percent Pentium compatible, and in some ways is more like a 486. Though most software works just fine on a Cyrix, games can suffer if they have not been tested and written to take the 6x86 into consideration."**

TECHNICAL EDITOR CHRIS DUNPHY REPLIES: *Calm down! Before you go insane, try broadening your bug search. Try a few other 3D-accelerated games to determine if the problem only occurs with* IndyCar 2. *If it doesn't, you may have bought a flaky card and should promptly exchange it. Maybe a new Screamin' 3D will make the problem go away.*

Your motherboard and CPU should work fine with the card, but incompatibilities do tend to pop up in the strangest places. Just work methodically to zero in on the problem. Do the Windows drivers work? Do DirectX games perform well? Do VESA games in DOS run? How well does Direct3D work? Do all Rendition-specific titles fail, or only some? Once you have as much information as possible, give Sierra tech support a call, and give them hell. Drop us a line to let us know how it goes.

> **"I have a 16x CD-ROM (IDE), and I was wondering if it would conflict with the SCSI drive. (I plan to upgrade it to a SCSI DVD-ROM drive eventually.)"**

Disc Dilemma

I'm having a hard time reading a CD-ROM that came with a book. When I described the problem to the tech support guy, he mentioned that it was written in Joliet format and would require an updated driver for my Cirrus Logic 4X IDE CD-ROM. I can't locate the driver on Microsoft's site or Creative Labs' site. Any ideas?

Barry Kopulos

DISC EDITOR SEAN CLEVELAND REPLIES: *Win95 uses the Joliet file system for long file names and deep subdirectories on CD-ROMs. Joliet permits the use of Unicode characters, clarifies some ambiguities in the ISO 9660 standard, and provides some additional extensions. I doubt that this is the problem, because most discs that ship (including the* bootDisc) *are cut with the Joliet file system. Some older 4x CD-ROM drives contained firmware that didn't support mixed-mode discs or discs that didn't contain a highly reflective surface, such as one-off gold discs. You may be having this problem, and it may be time to upgrade your drive.*

It could also be that the disc is at fault. Have you tried it in another CD-ROM drive?

Jurassic Card

My video card is an ancient PCI board from Trident. The accelerator chip is a TGUI 9680 dating back to the days when spreadsheets and word processors were considered graphics-intensive applications. In most games, particularly the game demos included on the *bootDisc*, a rectangular area around the mouse pointer isn't updated when the screen moves or changes. Switching to the generic Trident SuperVGA drivers included with Windows solves the problem, but then I can't break beyond the 256-color barrier. Should I buy a new video card?

Luis José Romero

TECHNICAL EDITOR CHRIS DUNPHY REPLIES: *Egad, yes! Retire that dinosaur, and your machine will be much happier. For $200 you can outfit yourself with a new graphics card that you can be really proud of.*

If money is tight, there are some fairly nice 2MB boards a generation old that will only set you back $70 to $90. Even the least powerful of the ViRGE boards will seem like a huge leap forward from where you are now.

SCSI Convert

I currently have an IDE hard drive that needs replacing, and I decided I would dabble in the dark arts of SCSI. I want to copy all my existing files to the new drive, but I'm not sure if my IDE drive will like the new SCSI drive. Also, I have a 16x CD-ROM (IDE), and I was wondering if it would conflict with the SCSI drive. (I plan to upgrade it to a SCSI DVD-ROM drive eventually.)

ASH

TECHNICAL EDITOR CHRIS DUNPHY REPLIES: *Your new SCSI drives will sit on an entirely different bus from your existing IDE peripherals; thus, they should not interact with each other at all. You have no reason to fear any funky problems, and odds are you will soon be preaching the SCSI gospel to the world. Just be sure to buy a good SCSI adapter board—avoid the bargain of the week. Anything by Adaptec should do fine.*

Overdrive or Dive?

I have a Gateway 2000 486sx-33. It's really crappy. I'm hoping to put in an Overdrive chip, or something like it. I was wondering if you could do a short story about them so people like me could find out if it's worth getting an Overdrive chip, or if it's better to just get a new computer. Thanks in advance.

Dominick Pesavento

TECHNICAL EDITOR CHRIS DUNPHY REPLIES: *Once upon a time, long, long ago, the 486 was a hot chip. Not anymore. Any money spent upgrading a 486 system is wasted, particularly since Pentium prices have fallen so much. Save your change, and retire that old clunker to serve as a kitchen recipe-database machine as soon as you can.*

Getting Scatological

I'm very pissed off! I just bought *boot* 10 with the bootMark 12-Step. I have a P166 with MMX and 32MB of RAM, and I got a result of 47 on the CPU/motherboard test. You guys said to expect at least a 75. What the hell's that about? The 200MMX machines reviewed that month barely pushed 51! So a 200MMX is below average? Or does a person need a supercomputer to run games? Most people can't afford Pentium Pro or Pentium II. You guys think everyone should have these supercomputers just because you get everything free. You probably think my computer's a hunk of crap just because it's a P166.

Tyler

REVIEWS EDITOR ANDREW SANCHEZ REPLIES: *No, a P-200 is not below average. An average P-200 MMX system will score anywhere from 50 up to about 60. A score of 75 is a median, because it's right in between 0 and 150. It's a bit high, but we're already seeing Socket 7 systems meeting or exceeding that score. Look at Xi's AMD K6-233 system on page 76 of* boot 11; *it scored well over 80 on the bootMark. A Pentium II 266 scores about 125 on the bootMark. If your system scores between 50 and 75, we consider it average, and well within acceptable standards to run today's software.*

WHITE PAPER

YOUR PERSONAL TECH **BRIEFING** ON THE **CONCEPTS** AND **COMPONENTS** THAT MAKE UP THE **PC** EXPERIENCE

this month:

Riding the Big Buses

Geek test:
The word *bus* brings to mind:
a. Traumatic memories of wedgie attacks while on the way to grade school, or
b. Traumatic memories of IRQ conflicts while trying to install your first sound card in a 386 system. If you're surprised to discover your computer even has a bus (and are now sniffing the floppy slot for diesel fumes), calm down. The buses we're talking about are your machine's electrical arteries. Like all life-giving conduits, they carry data to and fro to keep your box alive. There's more than one flavor of computer bus. In fact, just about every electrical connection inside your machine is technically considered a bus. But the ones you're most likely to hear about are ISA, PCI, EISA, MCA, and AGP. These are the big buses. If you ever rode the little buses in grade school, please turn to page 128. Even if you answered "b" on the geek test, you still might not be sure of the differences among all of the buses. Welcome to this month's White Paper.
— *Chris Dunphy*

BUS RIDING

Consider the computer bus to be a multilane highway that carries data between a master and any slave device located on the same stretch of road. The different lanes of the highway are defined to carry data bits, handshaking bits, and address bits that indicate which slave should be speaking and where in memory the data is destined. In simple buses, each lane generally does only one thing. However, to limit the number of wires on your motherboard, some buses allow lanes to do double duty. At one point they carry an address and, later in the data transfer cycle, data on the same wires. This technique is called *multiplexing*.

In simpler buses, the master is generally fixed, but modern buses such as PCI (Peripheral Component Interconnect) allow slaves to temporarily become bus masters, allowing for more efficient data transfer by bypassing the need for every read and write to pass through the master regardless of destination.

To get data from one bus onto another, a bridge is used. In a modern system, your motherboard chipset typically acts as a master bridge, shuffling data from the ISA (Industry Standard Architecture), PCI, IDE (Integrated Drive Electronics), memory, and Pentium local bus. Because all data passes through this central switch box, the performance of your motherboard chipset is nearly as critical as the speed of your CPU for overall system performance.

ISA: THE BUS THAT WOULD NOT DIE

The original IBM PC featured a simple and slow 8-bit bus for adding expansion cards. As PC clones evolved, this bus became known as ISA. When the PC-AT featuring the 286 came out, the ISA connector was stretched to allow for 16-bits of data to flow per clock cycle, and the speed of the bus went up to 8MHz to 10MHz. This allowed for a maximum data speed of 8MB/sec.

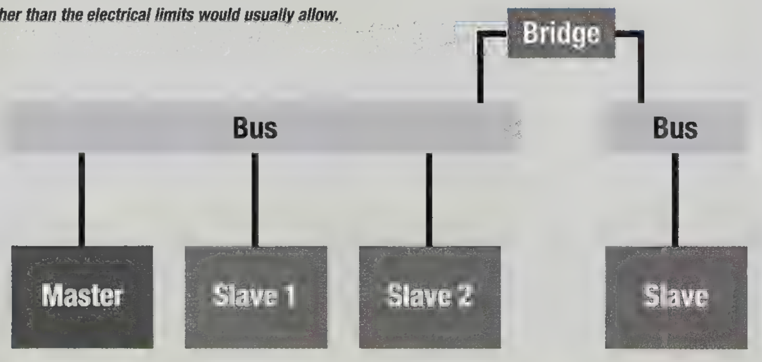
The ISA bus doesn't provide any means of allocating IRQ (interrupt requests) lines and other resources automatically to cards. This has made it difficult for cards to coexist without conflict. But the ISA bus has refused to die because it's dirt cheap, pervasive, and easy to design for. The Plug and Play protocol has somewhat eased the problem of having to manually configure ISA cards, but ISA's days may at last be numbered. Microsoft plans to eliminate the need for ISA in PCs designed to the PC '98 hardware spec.

EISA: ISA EXPANDS

Even in the days of the 386, ISA was considered to be slow and difficult +to work with. Computers needed a faster bus, and Extended ISA answered the call. EISA doubled the number of connections on the ISA bus to allow for 32-bit data transfers, but did it in such a way that EISA slots could still support 8- and 16-bit cards. EISA also allowed for automatic configuration and bus mastering. To remain compatible, EISA was clocked at 8MHz, but the doubled data width and improved protocols sped transfers up to a maximum of

AN INTRODUCTION TO BUS SYSTEMS

The master instructs the slaves to send data or to be ready to recieve it. A bridge chip is used to extend a bus logically further than the electrical limits would usually allow.



33MB/sec. Unfortunately, EISA was expensive and complicated to implement, and it only caught on in a few server systems. It has since been supplanted by PCI.

MCA: IBM GETS GREEDY

The Micro Channel Architecture (MCA)replaced ISA in IBM's PS/2 line, returning to IBM strict control over who made cards for their systems. So no one did. Those unfortunate enough to buy PS/2 systems found that the few expansion cards were inordinately expensive. Technically, the MCA bus was slightly superior to EISA, allowing for both 32-bit and 64-bit implementations and slightly faster performance, but the proprietary nature of the MCA bus destined it for the scrap heap.

VLB: NEED FOR SPEED

When the 486 came out, there was suddenly a need for high-performance graphics cards—and ISA couldn't accommodate the new breed. VLB (Vesa Local Bus) filled this void by essentially taking the 486's local CPU bus and wiring it up to a slot. Since the 486's CPU bus was never intended to support add-on cards, bus mastering and auto-configuration were nonexistent, but the speed was there. VLB slots ran at the same speed as the CPU, which typically ranged from 25MHz to 50MHz, and allowed 32-bit transfers to fly along at up to 132MB/sec.

PCI: MODERN LOVE

Today's Peripheral Component Interconnect bus is a well-defined industry standard engineered to meet the needs of today's systems. It's fast, powerful, feature-rich, and processor agnostic. PCI is the bus of choice on just about every computer today, including SGI workstations, Macs, and every Pentium PC.

PCI uses a multiplexing scheme to share address and data pins, allowing 32 bits to be transferred per clock without too many prohibitively expensive pins. PCI systems are typically clocked at 33MHz; the theoretical maximum bandwidth is 132MB/sec. Automatic configuration and bus mastering are central to PCI's design, and are thoroughly implemented.

The recent PCI 2.1 spec defines an extension to the PCI connector to allow 64-bit transfers, which has started to show up in a few server-class machines. PCI 2.1 also defines a 66MHz clock speed, but this is electrically difficult to implement and may limit systems to two cards per PCI bridge. No PCs support 66MHz PCI.

AGP: TURBO GRAPHICS

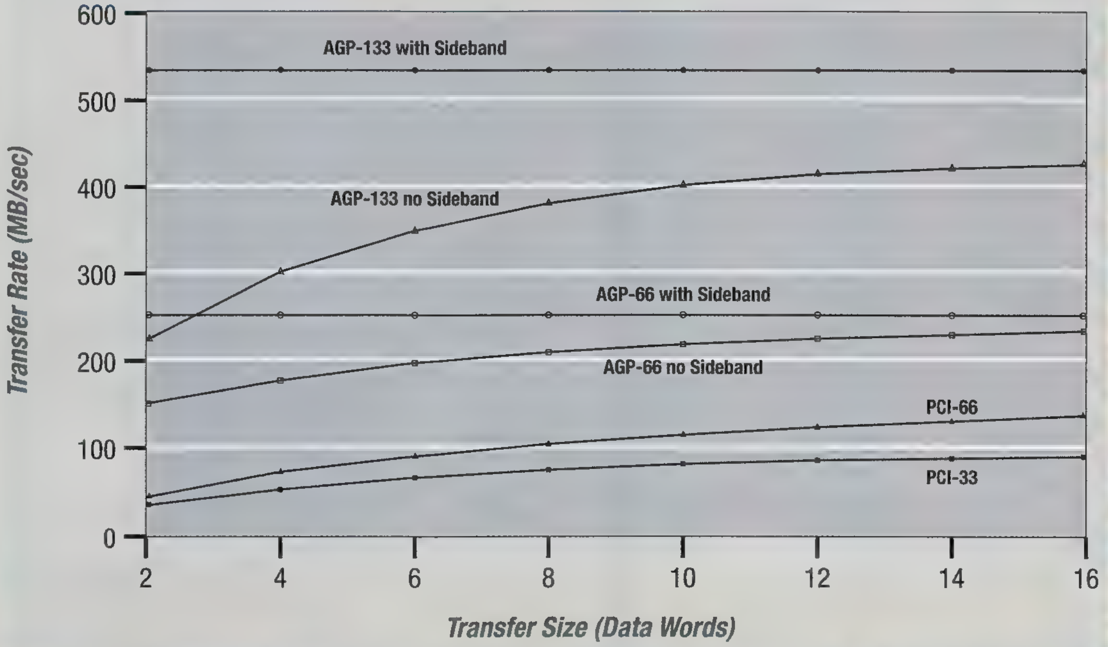
Even PCI is challenged by the data needs of a hungry 3D accelerator. To help satisfy massive demand for access to memory, Intel has engineered a new bus, Accelerated Graphics Port (AGP), that will be showing up on systems late this year, allowing for 266MB/sec bandwidth.

AGP is based upon the PCI 2.1 66MHz spec, but allows for much deeper pipelining of reads and writes to take better advantage of the theoretical maximum bus speed. AGP also defines some new pins to allow for sideband address signaling, allowing new addresses to be queued up for reading without the need to interrupt the data flowing over the main channel of the bus. Finally, AGP defines a 2X mode (also known as AGP-133) that allows two 32-bit data chunks to be transferred per 66MHz clock, effectively doubling the speed to a peak of 532MB/sec. 2X mode, sideband addressing, and support for execute mode aren't required from every AGP system, and early AGP graphics cards may not support all of these features—so be aware that AGP implementation may differ from 3D chip to 3D chip.

Intel will only be releasing AGP-enabled motherboard chipsets for Pentium II machines, but AMD is working furiously to come out with a Socket 7 AGP-enabled chipset. The first wave of AGP accelerator cards may not offer much over their PCI variants, but once AGP 2X is widespread, and the software issues are worked out (Microsoft intends full support for AGP in Windows 98), AGP will become a graphics must-have. Intel is currently defining an AGP 4X mode that will double speed yet again, providing over a GB/sec bandwidth to main memory.

AGP AND PCI SPEEDS COMPARED

AGP may not be as general purpose as PCI, but it excels at its specialty: moving data from memory to your graphics card—FAST.



HARDWARE ON THE HORIZON AND SOFTWARE SOON TO SHIP

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Heavy Gear 74
Forgotten Realms: Baldur's Gate 76
Zork Grand Inquisitor 78
Sharp SE-500 Mobile Organizer 78
Sub Culture 79

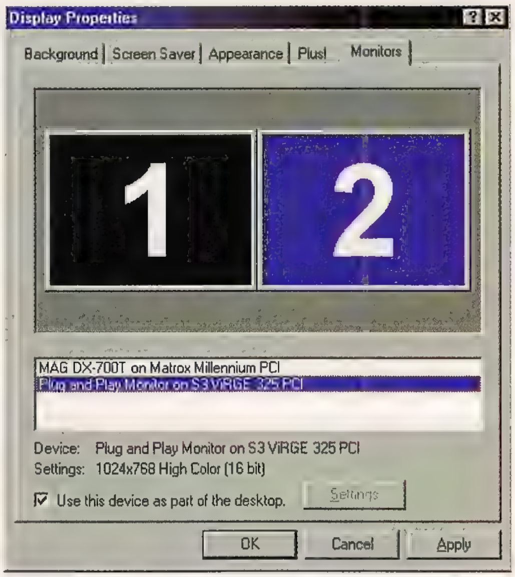
The boot Tracking Sheet

TITLE	DEVELOPER	DATE
Intense 3D Voodoo	*Intergraph*	*8/97*
Flight Unlimited II	*Looking Glass Technologies*	*8/97*
Flying Tigers	*Holy Grail/PIE*	*8/97*
450NX PCIset	*Intel*	*8/97*
Hexen II	*Activision*	*8/97*
Armored Fist II	*NovaLogic*	*9/97*
Flight Simulator 98	*Microsoft*	*9/97*
G-Police	*Psygnosis*	*9/97*
Jedi Knight	*LucasArts*	*9/97*
Lands of Lore II	*Westwood*	*9/97*
StarCraft	*Blizzard*	*9/97*
Total Annihilation	*Cavedog/GT Interactive*	*9/97*
AMD 640 PCIset with AGP	*AMD*	*10/97*
Age of Empires	*Microsoft*	*10/97*
Dark Earth	*Kalisto/EA*	*10/97*
F22 Air Dominance Fighter	*DID/Ocean Int'l*	*10/97*
Grand Prix Legends	*Papyrus*	*10/97*
Myth	*Bungie*	*10/97*
Rebellion	*LucasArts*	*10/97*
SandWarriors	*Interplay*	*10/97*
Screaming Demons	*Activision*	*10/97*
Sub Culture	*Criterion/Virgin*	*10/97*
Blade Runner	*Westwood*	*11/97*
Close Combat: A Bridge to Far	*Microsoft*	*11/97*
Kings Quest: Mask of Eternity	*Sierra*	*11/97*
Populous: The Third Coming	*Bullfrog/EA*	*11/97*
Redline	*Accolade*	*11/97*
Sid Meier's Gettysburg	*FireAxis/EA*	*11/97*
Test Drive 4	*Accolade*	*11/97*
Ultima Online	*Origin/EA*	*11/97*
Unreal	*Epic MegaGames*	*11/97*
AMD K6 300MHz	*AMD*	*12/97*
6x86MX 300MHz	*Cyrix*	*12/97*
MediaGX MMX	*Cyrix*	*12/97*
AMD 640 PCIset/AGP/ 100MHz bus	*AMD*	*12/97*
GF-1000 DVD-RAM drive	*Hitachi*	*12/97*
10th Planet	*Bethesda*	*12/97*
Baseball 3D	*Microsoft*	*12/97*
Anachronox	*Eidos*	*12/97*
CART Precision Racing	*Microsoft*	*12/97*
Daikatana	*Eidos*	*12/97*
European Air War	*MicroProse*	*12/97*
F-22 Raptor	*NovaLogic*	*12/97*
Gardians: Agents of Justice	*MicroProse*	*12/97*
Heavy Gear	*Activision*	*12/97*
Jack Nicklaus 5	*Accolade*	*12/97*
Longbow 2	*Jane's*	*12/97*
Lunatik	*Pure Entertainment/ Psygnosis*	*12/97*
The Dark Project	*Looking Glass Technologies*	*12/97*
Wing Commander: Prophecy	*Origin/EA*	*12/97*
MMX 2	*Intel*	*Q1/98*
Adrenix	*Digital Dialect/PIE*	*Q1/98*
F22 Total Air War	*DID/Ocean Int'l*	*Q1/98*
MechCommander	*MicroProse*	*Q1/98*
Prey	*3D Realms*	*Q1/98*
Quake II	*id*	*Q1/98*
Sin	*Activision*	*Q1/98*
Star Trek: First Contact	*MicroProse*	*Q1/98*
Windows 98/Memphis	*Microsoft*	*Q1/98*
450BX PCIset/Slot 2	*Intel*	*Q2/98*
Duke Nukem Forever	*3D Realms*	*Q2/98*
MechWarrior III	*FASA/MicroProse*	*Q2/98*
Windows NT 5.0	*Microsoft*	*Q2/98*
Crusader III	*Origin*	*posponed indefinitely*
Ultima IX	*Origin*	*posponed indefinitely*

**These dates are subject to change*

Windows **98**

It's beginning to look a lot like Memphis


Display Properties

MAG DX-700T on Matrox Millennium PCI
Plug and Play Monitor on S3 ViRGE 325 PCI

Device: Plug and Play Monitor on S3 ViRGE 325 PCI
Settings: 1024x768 High Color (16 bit)
☑ Use this device as part of the desktop.

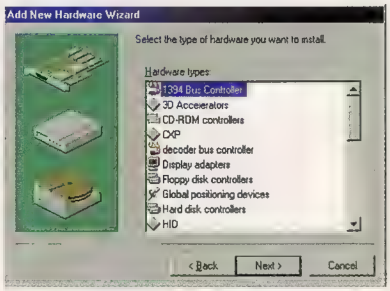
When a secondary PCI video card is added to a system, Windows 98's Display Properties change to show the number, type, and virtual desktop position of the connected monitor.

If "Start Me Up" was the anthem for Win95, "Time Waits For No One" is the tune for Win98. With few changes to the interface (beyond the *Internet Explorer 4.0* kludge) and no core speed improvements, Win98—expected to be released early next year—realizes its potential through the sheer abundance of hardware it supports.

Call it a glorified service pack, if you will. The latest update to Windows, codenamed Memphis, covers a lot of ground in providing integrated support for all the latest advances in PC hardware.

Beneath Win98's hauntingly familiar front end lies an elegant patchwork of 16- and 32-bit code that supplies full support for new technologies such as USB, DVD, AGP, and FireWire. These and future device drivers will be written to the Win32 Driver Model (WDM), which brings together support for all the major classes of devices. Custom-tailored mini drivers pick up the slack for specific device needs. Support for WDM is retrofitted into Win98 through NT kernel services, so Win98-native devices will run automatically on NT 5.0 when it's released next year. Hardware makers can finally write the same drivers for both operating systems.

DirectX 5.0 and ActiveMovie will be built into Win98, as will support for the Advanced Configuration and Power Interface (ACPI) specification used by the next generation of motherboards. ACPI allows you to control any device connected to your PC directly from the desktop. This means capabilities for wake-on-ring for modems, intelligent powering-down of inactive devices, and instant-on system readiness with a key-click or defined event.


Add New Hardware Wizard

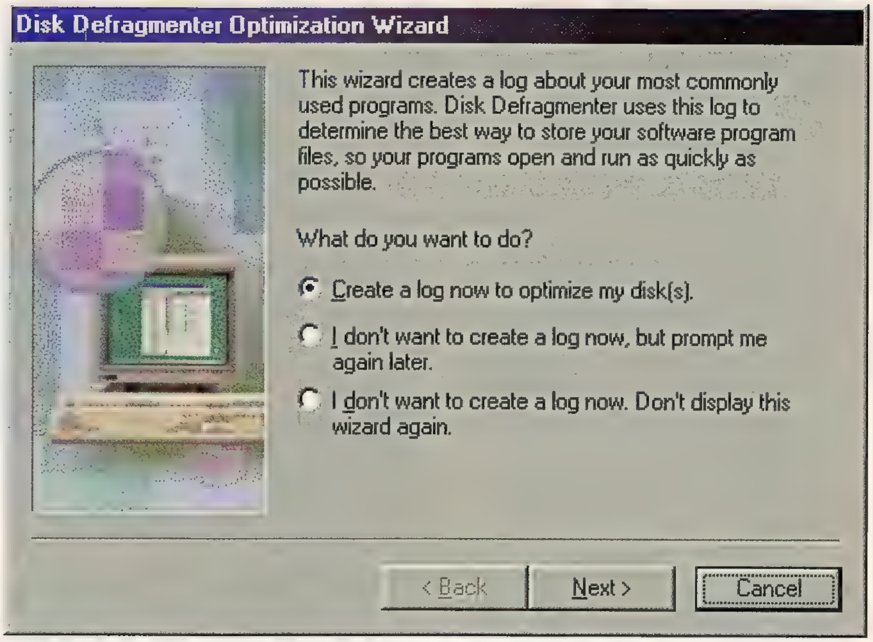
Select the type of hardware you want to install.

Hardware types:
1394 Bus Controller
3D Accelerators
CD-RDM controllers
CXP
decoder bus controller
Display adapters
Floppy disk controllers
Global positioning devices
Hard disk controllers
HID

Hot Plug-and-Play for USB, DVD MPEG-2 decoders, and IEEE 1394 host adapter support are all spec'd for the full release.

On the video front, OS support for multiple displays has finally arrived. Win98 lets you build your own video wall, with up to eight PCI video cards. Separate resolution, color depth, and refresh-rate adjustments for each display will go a long way toward pleasing webmasters, multimedia developers, and gamers looking to broaden their horizons. Secondary displays work as extensions of your desktop without the toolbar across the bottom. Applications built to handle separate autonomous windows will be able to span multiple monitors, but many apps will have to be modified before they can take full advantage of foreign acreage. For example, the next version of *PowerPoint* is being written to allow slides to show on one monitor while notes are displayed on the other.

New to the Control Panel is support for scanners and digital cameras, which, along with an



This wizard creates a log about your most commonly used programs. Disk Defragmenter uses this log to determine the best way to store your software program files, so your programs open and run as quickly as possible.

What do you want to do?

● Create a log now to optimize my disk(s).

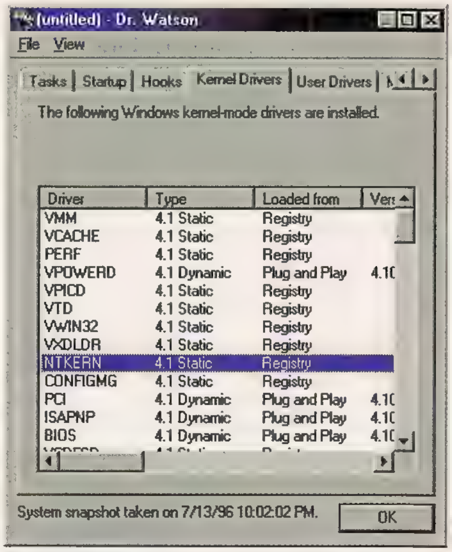
○ I don't want to create a log now, but prompt me again later.

○ I don't want to create a log now. Don't display this wizard again.

Before defragmenting you can choose the applications you use most frequently and the Disk Defragmenter monitors which files are used with the app and, during the defrag, reorders them accordingly on the hard drive with dll's and helper files existing in the same region as executables.

Installation Wizard, is a handy place to keep track of TWAIN drivers. Point-to-Point Tunneling Protocol is a welcome addition to Win98's dial-up networking control panel as well. Other improvements include Multilink Channel Aggregation, which provides a way to combine all available dial-up lines for higher transfer rates. When combined with the new ISDN Configuration Wizard, this makes the most difficult part of ISDN installation getting the phone company to stretch a new line into your neck of the woods.

Win98 is also gunning to be the OS that runs your entertainment center. Integrated broadcast services and future hardware support are planned for new satellite and cable-tuner cards, as well as USB sound and FireWire audio and video. Working with IP multicast downloads through broadcast vertical-blanking intervals, Win98's new TV Explorer displays television signals either full-screen or with HTML pages that are updated and timed with the program's script. Advanced functions such as integrated chat and e-mail are planned for the full release. Working side by side with the TV Explorer, the new Program Guide uses the information processing power of your PC to handle up to 1,000 channels, intelligently search for anything from actors to subject matter, schedule reminders for future programs, and set up sign-ons that can restrict access for younger family members.



The following Windows kernel-mode drivers are installed.

Driver	Type	Loaded from	Ver
VMM	4.1 Static	Registry	
VCACHE	4.1 Static	Registry	
PERF	4.1 Static	Registry	
VPOWERD	4.1 Dynamic	Plug and Play	4.1
VPICD	4.1 Static	Registry	
VTD	4.1 Static	Registry	
VWIN32	4.1 Static	Registry	
VXDLDR	4.1 Static	Registry	
NTKERN	4.1 Static	Registry	
CONFIGMG	4.1 Static	Registry	
PCI	4.1 Dynamic	Plug and Play	4.1
ISAPNP	4.1 Dynamic	Plug and Play	4.1
BIOS	4.1 Dynamic	Plug and Play	4.1

System snapshot taken on 7/13/96 10:02:02 PM.

In addition to providing detailed information on the state of your system, the improved Dr. Watson intercepts program faults and tells you why they occurred.

Atop the new plumbing sits an *IE 4.0*-powered hyperlinked desktop that changes the predominant Windows metaphor from exploring to browsing. Single clicks launch applications, and forward and back buttons take you deeper into directories or out onto the web. Windows can be assigned hyperlinked properties by hacking the HTML code in the directory's *folder.htm* file. The Control Panel and My Computer are freshly enhanced with rollovers bringing up special properties in each, and an easily accessible Address Toolbar provides a quick way to launch web sites as well as executables. Favorites have been expanded to include network volumes and file shares, and can be added to and modified à la web links. But don't worry if you're not ready for the web to invade your desktop. You can always turn off the desktop/browser integration and go back to the old Win95 interface.

Scripting support debuts with Win98, as well as a host of new utilities. The Update Manager logs installed hardware and connects to a Microsoft web site that contains the latest drivers. When an update is available, the Update Manager notifies you of the new version and offers to install it automatically. The System File Checker takes a snapshot reference of your system when it's healthy so that when things go wrong you can restore files to their original versions. The Win98 Start Menu can now be rearranged and organized with drag-and-drop ease, and a Start Menu Wizard debuts to round up stray readme and help files, relocate single menu items to the main menu, and archive old links.

Microsoft's current trickle-down model for Windows development has the major innovations happening on the NT side first. Win98 will extend the 16-bit Windows kernel through one more revision, and there will likely be upgrades down the road, but the future lies in NT.

As opposed to Window's close ties to the Intel instruction set, the NT kernal is portable to newer architectures. As the need for backward compatibility lessens, the advanced features of NT combined with NT 5.0's promise of core DirectX 5.0 integration will draw power users away from Win98. Besides, can you imagine what Windows 2001 is going to be like? Shades of HAL 9000 anyone?

— Sean Downey

product info

Available *Q1/98*
Price *TBA*
Company *Microsoft*
Phone *800.426.9400*
URL *www.microsoft.com*

Longbow **2**

Three's company

This year's battle for air supremacy has begun and Longbow 2 *is almost ready to take flight. With its stellar graphics, no-compromise flight model, and advanced avionics, Jane's awe-inspiring* Longbow *proved the world's still hungry for hardcore flight sims. This much-anticipated sequel promises three player-aircraft to choose from (Longbow, Kiowa, and Blackhawk) and a new terrain modeler that will make your 3D accelerator scream.*

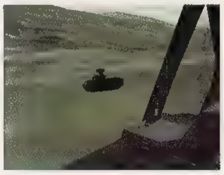
Origin's ***Andy Hollis*** *takes you below the tree line and primes you for the ride of your life.*

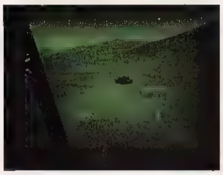
boot ***What kind of missions can we expect?***
Hollis There will be many ways to play. The first is Instant Action, a simple, fun way to jump into the aircraft and start killing things. In multiplayer, this will default to deathmatch-style play.

The second way is Single Missions. This collection of situations can be played in any order using any or all of the aircraft. It also allows us to offer more content after the sim ships.

The third way is the Mission Generator. This lets you change about 25 mission variables, including time, weather, enemy forces, friendly forces, and player helicopter to create unique missions. Similar to the Random Missions in *Longbow*, but with a great deal more control.

The final way is the new fully dynamic campaign system. Using customer comments, we've created a system that models every aspect of the ground war across a 50km front (about one division). Players start with a blank slate, and as commander of a helicopter battalion, you're responsible for assigning missions to four flights of helicopters. These flights can consist of any of the three player-aircraft types. Through the new mission planner, players track flights, missions, arming, timing coordination, set Waypoints based on terrain, and keep track of the inventory weapons and aircraft for their unit. Each time the player flies a new mission they're presented with options to fly recon missions, fly resupply missions, set up FARPs, do CAS, or participate in deep-strike missions. And, whenever an appropriate situation arises, a special hand-crafted mission is generated that moves the story along.





There are two scenarios: the National Training Center in Ft. Irwin California and Armenia/Azerbaijan. The first allows multiple players to fly dynamic campaigns against each other. The other has players fighting against the computer-controlled Iranian army as they try to claim the extensive new oil fields in the area. Of course, the difficulty and scope of the campaign can be controlled by extensive options, pleasing both hardcore sim players and the more casual pilot.

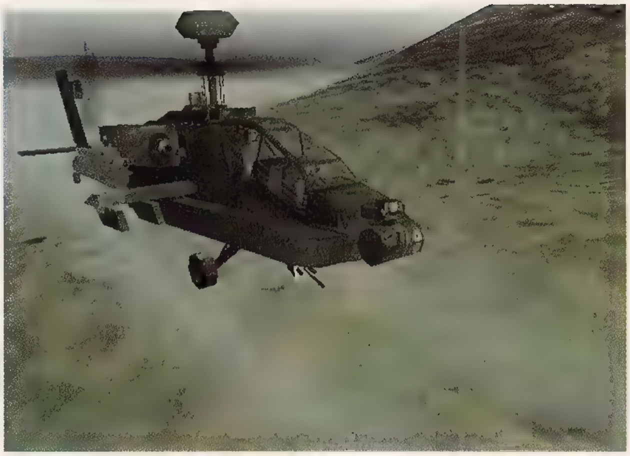
boot ***Will multiplayer make its way in?***
Hollis In a big way. Everything one player can do, multiple players can do. Instant Action, single or generated missions and the campaigns can all be enjoyed as either single or multiplayer experiences. There are four ways to fly multiplayer:
1. Cooperative—Same Aircraft (front seat/back seat). Each aircraft has separate roles for a pilot and a copilot/gunner/observer. When they fly this way, one person is responsible for flying, the other for deploying the weapon and/or sensor systems. They can even switch roles on the fly.
2. Cooperative as Leader/Wingman. Players fly together, with one person as the wing leader, the other covering as the wingman.
3. Cooperative as Leader/Leader. Players fly together on the same side, but each is in charge of their own flights, and each has a computer wingman.
4. Head to Head. Players fly in any of the above configurations against other players.

boot ***Will* Longbow 2 *use the same graphics engine as the original? How have you geared up the terrain generator?***
Hollis Much has changed since the original *Longbow*, what with advent of the 3D accelerator card. Our original engine was blazingly fast in software, but incompatible with 3D cards—so we completely rewrote the system to take advantage of today's technology. We also developed new generation processes that give us four times the detail in terrain and up to eight times the detail in objects. We've added all kinds of special effects, such as multiple-point light sources for cool rocket launches and explosions at night, and awesome particle effects such as dust-tracked vehicles and multi-part explosions. We can now do things in the flight engine we could only do in the pre-rendered cut scenes of the original game.

We'll still support software-only users, though a few new graphics features will be available only to those with 3D hardware. Initial support is for 3Dfx boards only, and is optimized for the Glide interface. Support for other cards will be available as patches after the product ships. This may or may not be through Direct3D.

boot ***Will the cockpit be made up of polygons or will you still use bitmaps?***
Hollis Both. For all three player-aircraft types, we'll support 2D bitmap cockpits as well as a fully textured polygon "virtual cockpit" for front-seat *and* back-seat.

boot ***Any other sims in the works that may link in with* Longbow 2*?***
Hollis *Longbow 2* already allows you to fly any of three helicopters, and it's all in the same box. We think that's an excellent value for customers. That said, we have the technology, so who knows?



Longbow 2 ***takes advantage of 3D acceleration to produce realistic terrains.***

product info

Available ***Q3 97***
Price ***$50***
Developer ***Jane's/Origin***
Publisher ***Electronic Arts***
Phone ***800.245.4525***
URL ***www.janes.ea.com***

Populous: The Third Coming

What if God was one of you?

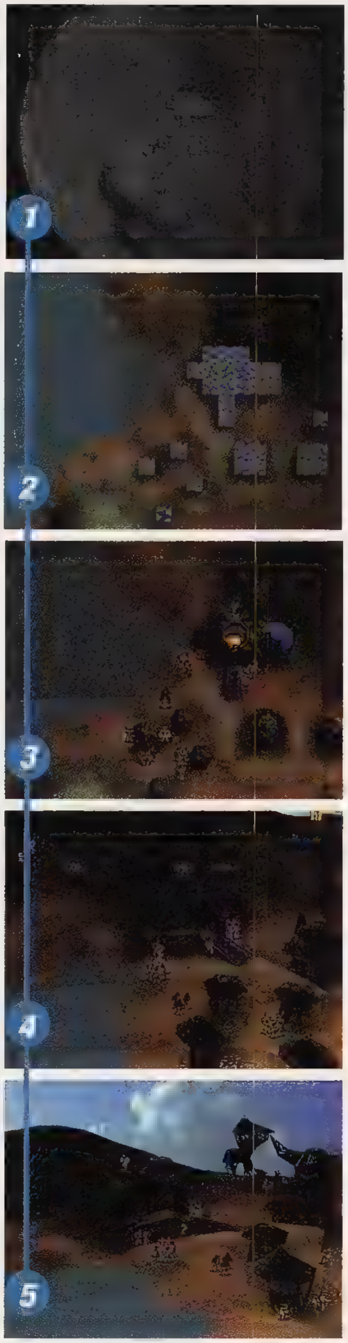
Your loyal followers turn to you for divine light. You are their god and it's your will that plagues the heretics and guides the chosen into Avalon.

Get ready to do the deity in Bullfrog's next god sim, Populous: The Third Coming. *Associate producer* **Pete Blow** *evangelizes about how to perform miracles, raise mountains, and bring on the bugs.*

boot* *What's the story behind* Populous: The Third Coming*?
Blow Four gods controlling four races of people conflict over the lands in the Populous universe. You play one of these gods and your objective is to wipe out the other three.

boot* *Ever since* Populous *started its own genre, developers have boosted the concept left and right. What new features will* P:TTC *bring to the table?
Blow A completely fresh landscape view including a fully rotational 3D environment with a unique curved horizon. The smooth zooming out to full view of the globe gives players the impression they are playing on the surface of a planet, rather than the flat surface of conventional gaming worlds. Every part of the game world is generated in real time, allowing extensive landscape modification and effects.

P:TTC's relatively small set of gaming elements is extremely easy to learn. There are, however, almost limitless ways these elements can be combined to create different strategies and techniques, resulting in an incredibly fun and interesting game.

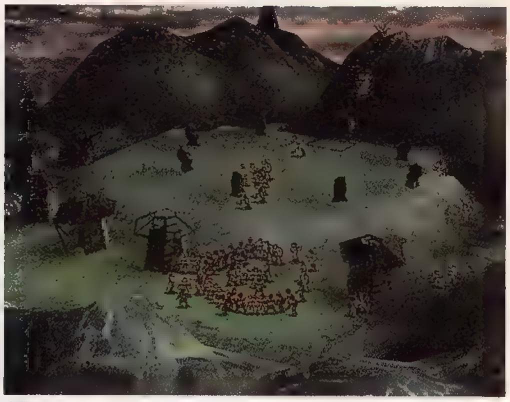


Zoom in and spy on your followers from your heavenly seat in Populous: The Third Coming.

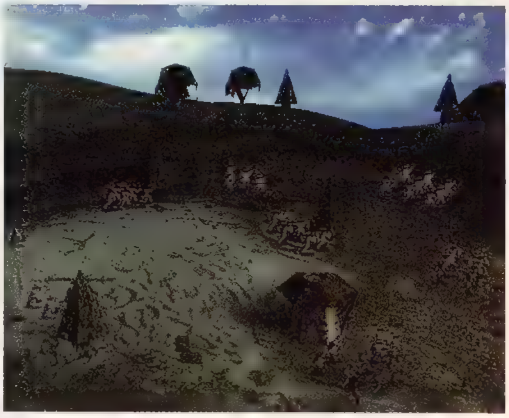
boot* *Is* P:TTC *using the* Magic Carpet *terrain generator or is it an original gaming engine?
Blow There are similarities between the two. Both are height-field based, using bucket sorting for the polygons. There is, however, no common code. We've taken what we learned on *Magic Carpet* to create the *P:TTC* engine and made it better. The 3D-object support is completely new. The landscape texture generation incorporating displacement and bump mapping is entirely new and ground breaking.

Map generation uses fractal algorithms with a facility for level designers to adjust each map point. The landscape is real-time rendered using texture-mapped polygons. Various pin mapping, shading, displacement, and bump mapping techniques allow real-time elements such as footsteps and volcanic lava flows, adding to the realism of the environment.

A typical scene has about 800 landscape polygons and about 300 object polygons. In some views, the landscape polygon count can double. Each of the *P:TTC* worlds will be four times the size of the original two *Populous* worlds.


Shamans work their magic and prime your followers for combat.

boot* *Divine powers have always been the centerpiece of the* Populous *series—what cool divine powers will you hit us with this time?
Blow Real-time morphing of textures and landscape means the landscape-modifying spells look awesome. Such spells include Erosion, Volcano, and Earthquake. The landscape morphs before your eyes, people fall from heights, buildings stretch, then explode. Other interesting divine powers include Plague of Insects, Angel of Death, Ghost Army, and Hypnotism.

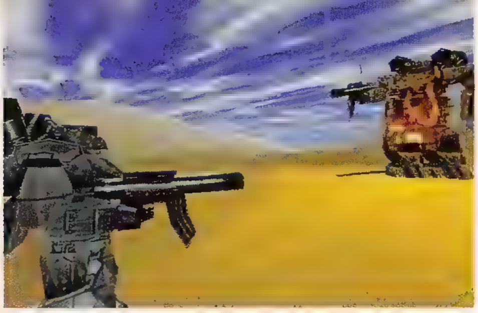

Real-time morphing landscapes will bend to your divine will.

product info

Available Q4 97
Price TBA
Developer Bullfrog
Publisher Electronic Arts
Phone 800.245.4525
URL www.bullfrog.co.uk

Heavy **Gear**

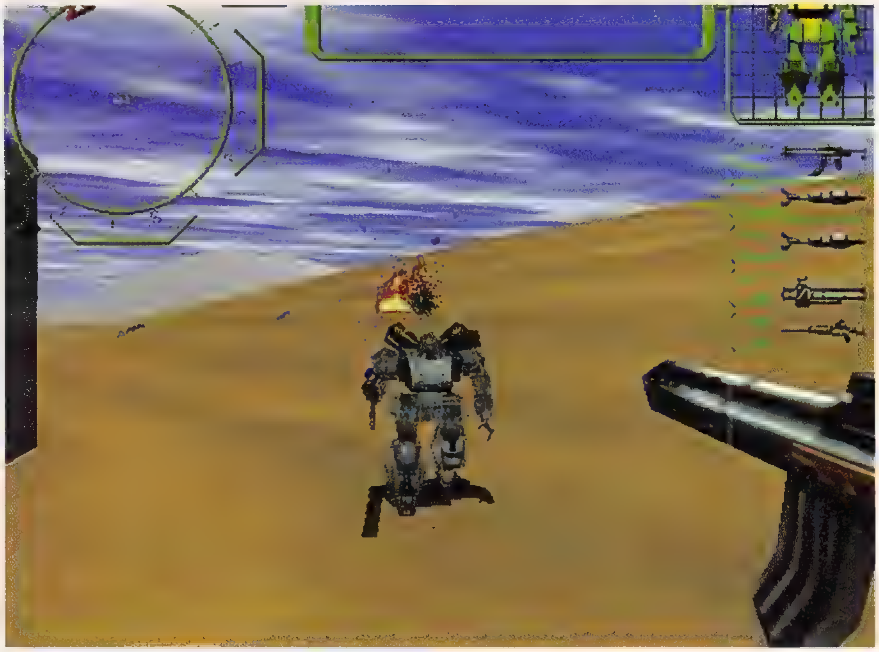
Make way for a new breed of mech



Rival Gears launch devastating attacks across a sea of sand.

Strapped inside the weathered hull of your Hunter, you stride across a war-torn battlefield ready to unleash the wrath of your Autocannon rifle. Welcome to the world of Heavy Gear.

Based on Dream Pod 9's pen-and-paper game of the same name, Activision brings fevered mech-on-mech action to your 3D-accelerated PC. **Tim Morten,** *director of* Heavy Gear, *gives you a glimpse into this dark future.*



Heavy Gear will offer 16 basic models of mech—with the option to customize—and will use high-resolution texture maps on its mechs, resulting in more realistic robots.

boot How closely will the PC game simulate the original pen-and-paper version of Heavy Gear?

Morten The computer version will be very much in line with the paper-based universe. There's a certain amount that doesn't translate from a turn-based game to a real-time combat simulator, but we make every effort to capture the essence of the paper-based experience in real time.

Dream Pod 9, the creators of the *Heavy Gear* universe, have been really helpful in giving us feedback on our story and game design. They're even going to incorporate elements of what we're doing into an upcoming book for the paper-based game.

boot Will Heavy Gear use the MechWarrior 2 gaming engine?

Morten It would be a mistake not to carry forward the great engine we created. We're revamping it to make the game faster and more detailed. We've converted the engine for fully Pentium-optimized floating-point math. Direct3D support will be built in, and we're upgrading our animation system to support more fluid motion. We've added rolling terrain, new weapon effects, seamless Internet support, and 3D sound.

boot What new techniques can we expect from Heavy Gear's in-game terrain generator? A totally textured universe? Dynamic colored lighting? Rolling hills?

Morten All of the above. Rolling terrain is standard, and many of our weapons and explosions take advantage of dynamic lighting effects, including colors. The terrain *really* affects gameplay; an enemy could be lurking behind any hill, and they're not so easy to hit when their elevation changes as they run over uneven ground. *Heavy Gear* will feature rolling hills, mountains, canyons, cities, caves, and more. Each environment requires different tactics: a city mission is about avoidance, but a hill mission is more about maneuvering.

boot What weather effects will there be?

Morten We use a particle system to create real-time weather effects. Weather mainly impacts the visibility in a mission.

boot How many mechs will be available?

Morten We're including 16 basic models, but customization allows a huge number of permutations.

boot What polygon counts can we expect for a typical mech?

Morten Polygon count varies according to distance. Up close you'll see 650 polygons.

boot With those polygon counts, what will we see in hardware support?

Morten *Heavy Gear* will be Direct3D compliant from the outset and MMX support comes at the driver level. With both MMX and an accelerator board, 3D acceleration would come from the accelerator board, and MMX should accelerate 3D sound and video playback.

boot How will multiplayer mayhem be handled? Will there be a battle.net-style server where Heavy Gear fighters can meet and duke it out?

Morten Although we haven't given our server a catchy name yet, we've actually had server-based Internet gaming since *Mercenaries.* We've advanced the technology for *Interstate 76*, and *Heavy Gear* will take the next step to being a seamless Internet environment.

boot Close combat's been sorely missing in mech games. Will Heavy Gear have it?

Morten Ramming is always a viable way to do damage, but *Heavy Gear* isn't about hand-to-hand combat so much as shooting. When it comes to combat, the gun is definitely mightier than the fist.

boot With FASA's MechWarrior 3 and Sierra's Earthsiege 3 vying for attention, what will make Heavy Gear stand out?

Morten Our strength has always been great gameplay. We're paying a lot of attention to what our fan base tells us. They've asked for an integrated story with cut scenes, vastly flexible vehicle customization, cooperative multiplayer play, the ability to stand up after falling, side-stepping, crouching... the list goes on.

This team and this engine set the standard for the giant-robot genre. You can bet we're going to do it again.

product info

Available Q3/Q4 97
Price TBA
Developer/Publisher Activision
Phone 310.473.9200
URL www.activision.com

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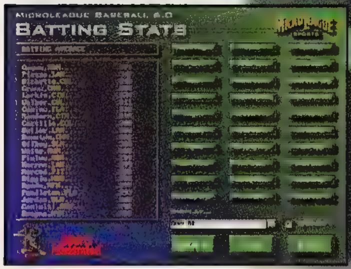
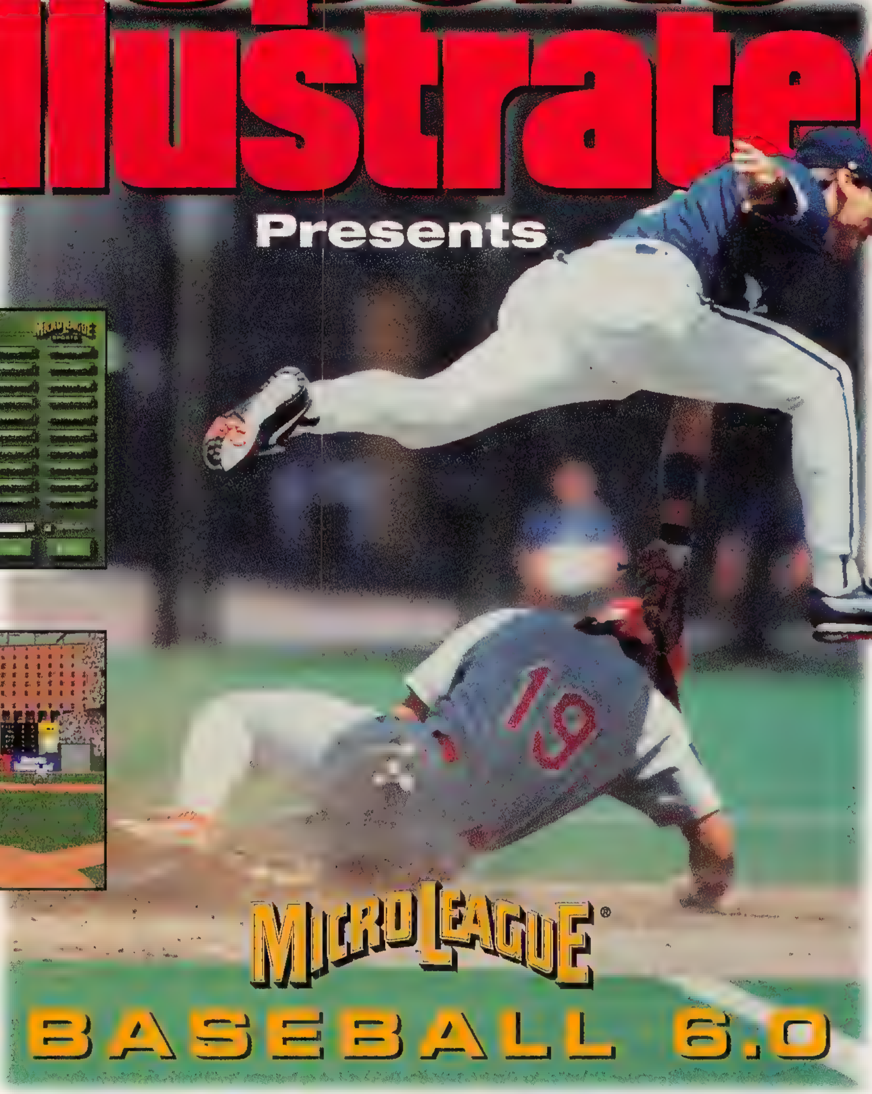
Presents





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Product Information Number 239

Forgotten Realms: **Baldur's Gate**

It's my party, and I'll die if I want to

Interplay's Forgotten Realms: Baldur's Gate *puts you in command of a wayward party of adventurers in search of truth, justice, and the almighty experience point.*

Hack and slash your way deep within the mythos of TSR's Advanced Dungeons & Dragons' Forgotten Realms. ***Dr. Ray Muzyka,*** *joint-CEO of Bioware, gives us the scoop on where the wild things are... and why you'd wanna slay them.*

boot** What's the premise behind* **Baldur's Gate?*

Muzyka This will be the first PC role-playing game to capture the feel of pen-and-paper AD&D. *Baldur's Gate* is one of the largest and most immersive computer RPGs ever made. It's set in the Forgotten Realms of TSR's AD&D universe.

Starting as an orphan, villains cast you out into the wilderness. The Sword Coast is in turmoil, the city states of Amn and Baldur's Gate are on the brink of war and no one seems to know why. You must make sense of the growing chaos and uncover your origins.

Forgotten Realms: Baldur's Gate is a *true* real-time RPG with multiple characters in your party. In addition to the original character you generate from scratch, up to five adventurers—selected from a pool of 24—can join you.

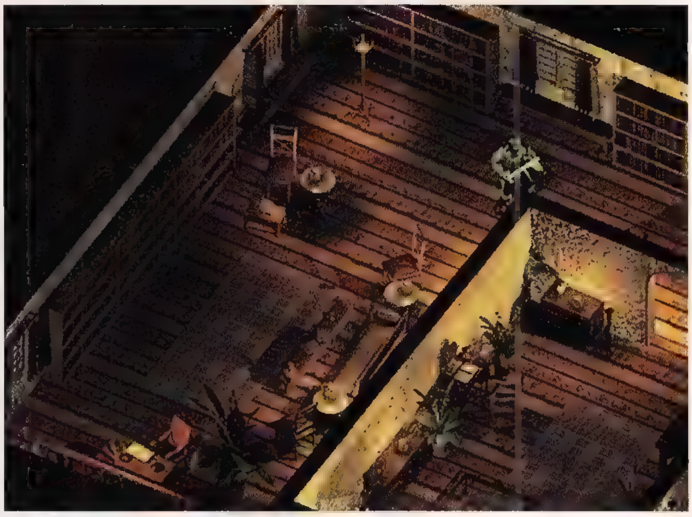
Diablo purported to be an RPG but the story was thrown in at the last minute, unlike *Baldur's Gate*, where the entire game is written around an intricate story and web of subplots. *Baldur's Gate* also looks better: our graphics are non-tiled (*Diablo* uses repetitive graphics) and fully rendered in an isometric top-down view in 16-bit color, which approaches photorealism. Our goal is to recreate the Forgotten Realms on the computer, and in your mind, your eyes, and your heart.

Unlike other isometric adventures, you'll stroll through a variety of terrain in Forgotten Realms: Baldur's Gate.

***boot** Will gaming be restricted to dungeon-hacking or will you deliver more?*

Muzyka We'll deliver much, much more. The entire coast is rendered in loving detail. Players can explore villages and cities, numerous dungeons and towers, and more than 10,000 unique 640x480 game screens. This represents, to the best of our knowledge, the largest RPG ever made. Luckily, we have a lot of source material to draw on: the rich heritage of the Forgotten Realms from TSR.

There are a lot of monsters with great animations—over 60 in all—all drawn from the TSR sourcebooks (Monstrous Manual, etc.): kobolds, gibberlings, basilisks, anhkegs, orgres, wolves, sirens, dryads, and more. The spell effects have great graphics, too, the spells being drawn from the AD&D sourcebooks.



Explore multilevel abodes in Baldur's Gate*, an AD&D RPG.*

***boot** How is each character different?*

Muzyka Characters can be any race or class allowed in the AD&D 2nd-edition rules: clerics, mages, fighters, thieves, paladins, druids, rangers, and bards (multi-classed characters are also allowed). Your main character's race can be human, elf, half-elf, halfling, dwarf, or gnome. There are many differences between these characters. Thieves hide in shadows, paladins and clerics heal or repel the undead, mages cast powerful spells, and fighters... fight!

You meet a lot of other characters who can join you. The races and classes look different on screen and you can customize their colors, weapons, and armor, so when you change weapons or armor you *see* it happen. This will add to the "immersion factor," and make you feel like you're there.

***boot** What kinds of weapons and spells will these characters have?*

Muzyka We draw heavily on the AD&D sourcebooks—magical swords, amulets, rings, potions, wands, belts, bracers... you get the idea.

***boot** Was this game designed as multiplayer from the start? How will the solo campaigns play?*

Muzyka The single-player version is the main game—a multiplayer version will probably follow. The game is first and foremost an RPG and the design is primarily single player. Luckily, the world is being designed to be adaptable for multiple players, and we're considering an online version as well.

***boot** Will* **Baldur's Gate** *use any type of graphics acceleration?*

Muzyka MMX and non-MMX versions are being developed. MMX-equipped players can expect better frame rates, larger animations, and more stuff happening on screen at once. The basic game will be the same though.

***boot** What about cool visual effects?*

Muzyka There will be dynamic lighting (light sources illuminate the characters and moving objects in the world), and 3D height maps (this game is really a 3D "2D" game), plus colored light sources—imagine the red flash on the ground as a fireball passes overhead. There are full weather effects and day/night cycles, too, as well as rain, snow, fog, sunrise, and sunset. We aim to create the impression that you are watching a window on a world from about 100 feet in the air.

product info

Available September 97
Price TBA
Developer Bioware
Publisher Interplay
Phone 800.468.3752
URL www.dragondice.com

http://www.thenet-usa.com
Daily Dose
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The universe will end in 43 trillion years, so what are you waiting for?

Zork Grand Inquisitor

Buddy can you spare a zorkmid?

Zork Grand Inquisitor *is the latest tale of high adventure set in the universe of grues and dark magic.*

Sporting the latest Z-Vision 360-degree graphics engine and tons of rendered vistas, ***Laird Malamed****, director of* Zork Grand Inquisitor, *gives us an advanced tour of the land.*

boot ***Where on the*** **Zork** ***timeline does*** **Zork Grand Inquisitor** ***take place?***
Malamed *Zork Grand Inquisitor* takes place 101 years after *Beyond Zork* and *Spellbreaker*, 700 years before *Return to Zork*, and 119 years after *Zork Nemesis*. You must defeat the Grand Inquisitor and return magic to the population of Zork. We wanted to select a piece of the timeline the other games hadn't dealt with in .

ZGI concentrates on the *Zork* humor and history more than the other graphic *Zork*s. We wanted to incorporate as much of the text history as possible, while keeping the game playable for *Zork* newcomers. We're also adding Magic to a *Zork* game using the *Enchanter* trilogy model.

boot **Zork Nemesis** ***introduced the world to your 360-degree graphics engine. Will*** **ZGI** ***use the same technology?***
Malamed *ZGI* is powered by an enhanced version of the Z-Vision engine used in *Zork Nemesis*. Enhancements include full-screen images, inventory, map, and spell casting screens, as well as new menu bars (for easy access to inventory objects and spells), and more audio and movies in surrounds. There's about 30 minutes of FMV, although some of that is entirely computer generated. Compression is still being determined.

boot ***How in-depth is*** **ZGI*'s*** ***inventory system? How about the puzzles?***
Malamed We've designed a new inventory system that's in keeping with the text series. Objects can be examined, combined, and used in many areas of the game. We're striving to predict what players will attempt and to add responses for everything. The puzzles are a combination of inventory puzzles and spell-casting tasks. The difficulty comes from having to think laterally about what spells can do and how objects can be used in different takes. It's not just a case of finding a key or code and using it on a door.

boot ***What new technological advances can we expect?***
Malamed We'll have more 3D Sound, more pana-animations, a larger screen, scalable MMX support, and a DVD version. We may use Creative Labs' Sound Fonts.

boot ***Pretty-picture-but-limited-interactivity games such as*** **Myst** ***and*** **Obsidian** ***are looking dated. What will*** **ZGI** ***do to avoid this?***
Malamed We've eliminated much of the extraneous navigation from the game. There are fewer nodes, so players can get to interaction faster. We also have a map screen that allows jumping to previously visited locales. Further, there is more going on in each node, so the game doesn't feel empty. There are also a number of characters who travel with you in the game and comment on your actions, provide clues, and add humor.

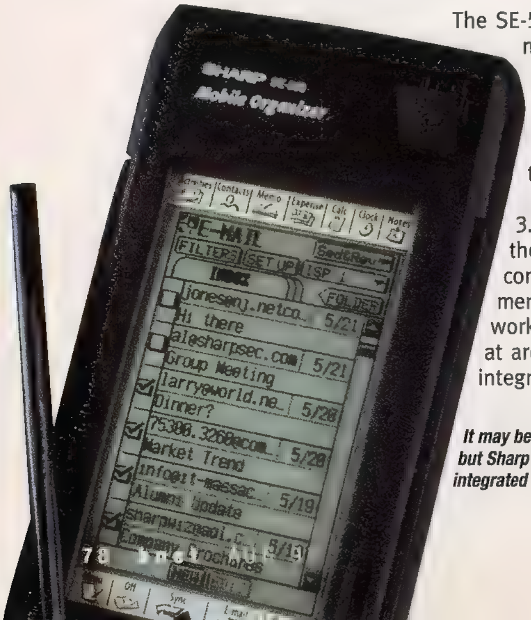
Zork Grand Inquisitor *will have more pre-rendered artwork than you can shake a grue at!*

product info

Available Q4 97
Price TBA
Developer/Publisher Activision
Phone 310.473.9200
URL www.activision.com

Sharp **SE-500** Mobile Organizer

Contender or pretender to the Pilot's throne?



The SE-500 Mobile Organizer is Sharp's $299 answer to U.S. Robotics' Pilot, and it comes with a few tricks of its own.

Measuring 5.9 x 3.5 x 0.7 inches, the 7-ounce SE-500 comes with 1MB of memory (with user work area hovering at around 640K), an integrated 14.4Kbps modem, and Internet e-mail software. The 240x159 LCD touch-screen will have an electroluminescent backlight, as well as an integrated protective cover. Connectivity with your desktop or notebook PC is a top priority, so the SE-500 includes an IrDA port as well as a free-standing docking station complete with 9-pin serial connector.

But without handwriting recognition, you must either use the on-screen keyboard or the *Notes* application, where on-screen scribbles become bitmap images you can attach to e-mail.

Pre-installed apps will include a robust personal organizer with contact lists, a calendar, expense reports, calculator, and world clock. PC-synchronization software that's compatible with programs including *Outlook 97*, *Lotus Organizer 97*, and *ACT! 3.0* will get you up and running with your PC PIM.

— *Andrew Sanchez*

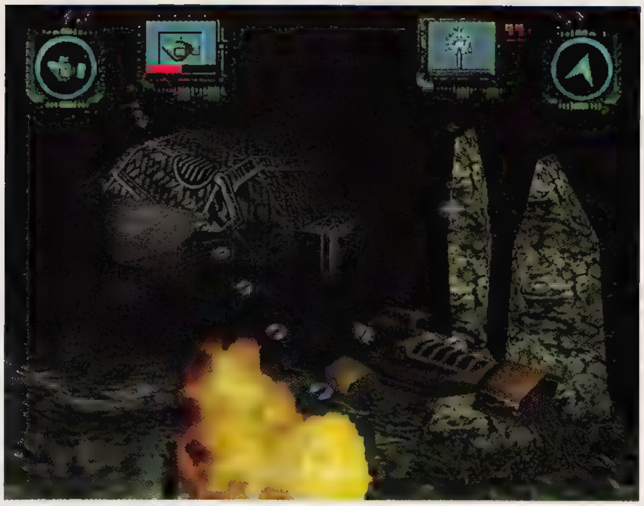
It may be bigger than a Pilot, but Sharp's SE-500 has an integrated modem.

product info

Available August 97
Price $299
Company Sharp Electronics
Phone 800.237.4277
URL www.sharp-usa.com

Sub **Culture**

Sleeping with the fish



Sub Culture*'s watery realm will tax your hardware to its limits.*

Sub Culture *fills the watery void left by Bullfrog's now-defunct* Creation. *Using hardcore hardware to the extreme,* Sub Culture *will drown you in a first-person action game deep within a watery world.*

Managing director **David Lau-Kee** *takes you down for a taste of submarine mayhem.*

boot** What's the premise behind* **Sub Culture?*
Lau-Kee Underneath the oceans, inch-tall tribes of intelligent life forms exist in a kind of parallel universe. One of the two main tribes, the Procha, are technologically adept and their cities are masterpieces of order. The other more communal tribe is the Bohine who are in touch with nature and have a much more informal society.

Two other tribes inhabit the oceans: the Brotherhood and the Pirates. The Brotherhood exists almost as a cult... trading is their religion. The Pirates survive by preying on the weak and unaccompanied, hunting in packs, and scuttling any sub that crosses their path.

You're a free agent at liberty to select who you'll work for and when. You're also free to subvert missions... you may start a mission working for one tribe, but then be persuaded to finish the mission favoring the other tribe.

Don't let the tranquil scenery fool you, **Sub Culture***'s world is filled with combat.*

boot** What genre of game is* **Sub Culture?*
Lau-Kee It's action adventure similar to *Privateer*, except the action is more in-your-face and accessible. The action comes from frequent battles with pirate sub packs, mutant fish, military bases, and secret machines of war—the trading is also very accessible. The adventure comes from the need to explore the world, and from the narrative.

***boot** First-person sub sims are a hard sell. What does* **Sub Culture** *have going for it?*
Lau-Kee *Creation* would have been a huge success if Bullfrog had managed to develop the quality gameplay and coherence they're known for. But it was on the drawing board too long and lost, or failed to develop, a compelling focus.

Archimedean Dynasty has some terrific qualities, but suffers harsh separation between "in mission" and "in dock" modes. The missions are far too "samey."

Other underwater games simply aren't on the same level—in terms of depth, polish, production values, and gameplay mechanics—as *Sub Culture.*

Getting started in *Sub Culture* is easy—players are up and running in minutes. Excelling is *a lot* harder. While there's coherence across the game, individual missions stand on their own. "All-nighter" play is the most rewarding, but a quick lunch-hour mission also works extremely well.

***boot** What in-game terrain generator will* **Sub Culture** *employ?*
Lau-Kee The engine we're using is called "DIVE," which was created from the advanced technology we're putting in future versions of RenderWare. DIVE uses a very compact representation for polygons (we can encode about 80,000 polygons in 2MB) by compressing the data and then expanding it in real time according to where the player is looking. This means terrain can be extraordinarily complex—more than 100,000 polygons are processed by the engine (of course, fewer are actually drawn per frame) at a time.

The most startling innovation is that there's no limitation to the type of terrain structure that can be used in *Sub Culture.* Previous games used simple height fields (a regular grid of points at varying heights, which limits how natural, interesting, and complex the terrain can be). I don't know of any other engine that allows arbitrary structures such as arches, caverns, pipes, and cave networks, rock overhangs, etc.

***boot** What about visual effects?*
Lau-Kee *Sub Culture* is entirely perspective-correct textured and lit in real time. You'll see shafts of light coming down through the water and dappling the seabed. You'll see the entire underwater world gradually becoming darker as night falls and brighter as day breaks. You'll see true alpha-blended transparency in the cockpits, and air bubbles and light on cavern walls when you shoot off a flare.

This will all be available in software on a P90 up through a P200 with hardware acceleration (faster machines will offer faster frame rates, higher spatial and color resolution, and more accurate hidden surfaces).

MMX helps with the advanced image-processing effects such as alpha-blending transparency. On a Pentium II we've been able to liberate cycles for a frighteningly high increase in overall frame rate.

We're still working on the final list of accelerator cards we'll support, but so far we have native support for the 3Dfx Voodoo, the NEC/VideoLogic PCX2, and the Rendition Vérité. A Direct3D driver that covers other chipsets will also be provided.

***boot** How many polygons will the seascape consist of?*
Lau-Kee The basic seascape has about 100,000 polygons. Objects vary from about 20 polygons for small shoaling fish, to 500 to 600 for some of the "special" subs that appear later in the game.

***boot** Will there be multiplayer mayhem?*
Lau-Kee No. In the end, we felt that the core gameplay mechanics would be compromised by multiplayer options. However, we are exploring a multiplayer spin-off game and an online version.

product info

Available *October 97*
Price *TBA*
Developer *Criterion Studios*
Publisher *TBA*
URL *www.ftp.canon.co.uk/studios/index.html*

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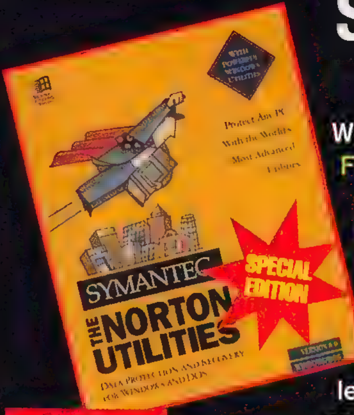
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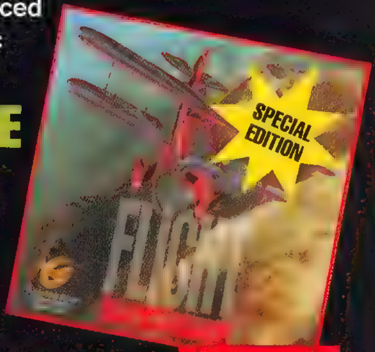
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boot

KICKIN' THE TIRES ON THE LATEST **HARDWARE** AND TAKIN' THE NEWEST **SOFTWARE** OUT FOR A SPIN

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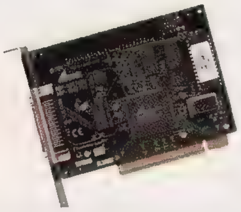
AdvanSys SCSI Host Adapter



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CD-**ReWritable**

Burning desire

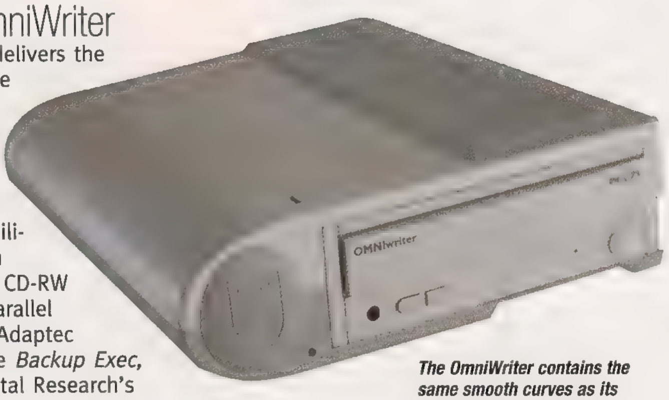
The most pathetic sight in the bootLab is the stacks of bad discs strewn about the CD-R testing station. These polycarbonate platters are unreadable in any CD-ROM drive and unrecoverable by any CD-R, yet no one has the heart to throw them out. When a drive can't keep pace with the data rate, or the mastering software fails, you get a bad disc that, if left to its own devices, will remind you of your failure well into the next century.

Blazing in to save the day are two new CD-ReWriteable (CD-RW) drives. Ricoh's MediaMaster and Philip's OmniWriter are the first of the new breed of CD recorders that bring erasability to the world of CD mastering. These CD-RW drives can write, erase, and re-write a single CD-RW disc more than 1,000 times, as well as write to regular CD-R media. They wipe clean a bad burn and erase a data-packed disc before you can say, "Who was that masked drive?"

Both are based around the same Philips 2xWrite/6xRead drive mechanism with 1MB onboard cache. Both work with Adaptec's DirectCD 1.0, *and support packet writing as well as all the CD-R formats CD-ROM, CD-ROM XA, CD Plus, CD-i and CD-DA. Unfortunately, CD-RW technology won't help the discs that have already fallen in the bootLab, but it may just keep us from killing again.*

— Sean Downey

Philips OmniWriter



The OmniWriter contains the same smooth curves as its predecessor, the CDD 2600.

The OmniWriter delivers the same performance specs as the Philips' CDD 2600 (reviewed in *boot* 10) along with new re-writable capabilities. It ships with both a CD-R and CD-RW disc, a SCSI-to-parallel converter cable, Adaptec *DirectCD*, Seagate *Backup Exec*, and Creative Digital Research's *HyCD Suite*.

We personally wouldn't trust the SCSI-to-parallel connector with more than the most gentle of data transfers. It works well with *DirectCD* and *Backup Exec*, but we had difficulties getting a successful burn when mastering with *HyCD Suite*. Before you chalk this up as a software problem, think again. The converter cable works well with packet-writing applications such as

CD-ReWritable Explained

CD-RW discs are rewritable because they use a different layering scheme than CD-R. CD-R drives write data on the surface of the media by burning the dye layer with a laser. Instead of a burning process, CD-RW drives use phase-change technology. The laser changes the state of the media's recording layer from reflective to light absorbing. Because this change in reflectivity can be reversed, the disc becomes erasable and reusable.

CD-RW discs currently run about $25. They have a lower reflectivity, so most CD-ROM drives can't read them. MultiRead is a new certification program for CD-ROM drives that adds automatic gain control to the optical pickup to correct this reflectivity problem and makes them capable of reading CD-RW discs. The Plextor CD-ROM drive reviewed in this issue on page 96 is a good example of a MultiRead drive.

DirectCD and *Backup Exec* because they cache data on the system's hard drive and send it to the drive in small buffer filling amounts. *HyCD Suite* and other CD-mastering packages pipe data through to the drive in a constant stream at a bandwidth beyond the capabilities of the converter cable.

The external drive sports a headphone jack and volume controls in the front with RCA audio-out jacks and two SCSI Centronics connectors in the rear. The drive knocked off fine scores in our CD-R mastering tests connected to our SCSI adapter without the converter cable.

Price $799
Company Philips
Phone 800.235.7373
URL www.philips.com

boot verdict 7

Dare to Compare

	Philips OmniWriter		Ricoh MediaMaster
Bundle	SCSI to parallel converter cable, Adaptec Direct CD v1.0s, HyCD Suite, Seagate Backup Exec		P.E. Logic ISA SCSI Adapter, Adaptec Direct CD v1.0s, Adaptec Easy-CD Pro v2.1
Interface	SCSI	Parallel to SCSI converter	SCSI
On-the-fly Torture Test (mins)	16	Buffer underrun	18
Create 390MB Image file (mins)	8	21	12
Burn 390MB Image File (mins)	24	Buffer underrun	23
Packet Writing (500MB) (mins)	46	52	46

Ricoh **MediaMaster**
MP6200S

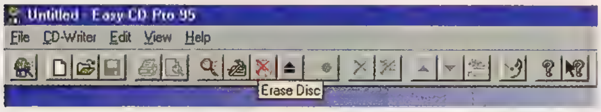
Ricoh has really done its homework and put together a smart little package. The MediaMaster is an internal drive that comes with everything you need to get started: two discs (one CD-R and the other CD-RW), Adaptec's *DirectCD* and *Easy-CD Pro 2.1*, and a P.E. Logic bus-mastering SCSI adapter.

Easy-CD Pro 2.1 is driven by Adaptec's powerful XCD engine, which is arguably the most reliable CD-mastering engine on the market. Its handy wizards guide you through complex mastering procedures, support extracting and editing audio tracks, and report on both recorder capabilities and session status.

The drive is tray loading with a headphone jack, volume control buttons, an eject button, and a single dual-colored LED that indicates drive status. Using *Easy-CD Pro* the MediaMaster performed on par with other 2xWrites/6xReads we've tested, taking our on-the-fly torture test in 18 minutes, creating a 390MB image file in 12 minutes, and burning the image in 23 minutes. It duplicated audio and mixed-mode discs without glitches and proved up to snuff for our audio extraction tests.

R
CD-RW
MP6200S

With a name that could give it membership status in the Legion of Superheroes the MediaMaster is a solid performer.



New to the Easy-CD Pro toolbar is simple one-button access to a full disc wipe.

The MediaMaster points to the future of CD-Recorders with re-writability and solid recording performance and a solid bundle.

Price $599
Company Ricoh
Phone 800.955.3453
URL www.ricoh.com

boot verdict 8

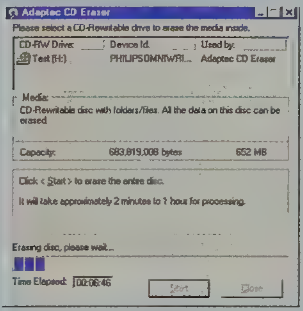
DirectCD 2.0

The version of DirectCD *included with CD-RW drives adds a little utility called* CD-RW Eraser. *It performs a clean wipe of a CD-RW disc that takes about 40 minutes, but you can't erase specific files with it.*

When you delete a file, DirectCD 1.0 *removes the files directory entry, but no space is reclaimed. Could random access erasability be too much to ask from a package that already performs UDF-compliant packet-writing through drive letter access? Unfortunately, random access erasability and direct file overwrite wasn't ready when the new CD-RW drives were, so Adaptec implemented this all-or-nothing solution.*

DirectCD 2.0, *which supports direct overwrite technology and fixed-length packets should be shipping by the time you read this. The current packet-writing scheme in* DirectCD 1.0 *uses variable packet lengths for greater compatibility with the majority of CD-R drives. Fixed-length packet writing is a more complex affair that keeps reading software from seeing the link blocks.*

DirectCD 2.0*'s fixed-length packet writing works similar to clusters on a hard drive with allotted spaces made for chunks of data. Combining this with direct-overwrite capabilities lets you write new files over old ones without the additional step of erasing the old file first, as well as add and remove individual files from the disc. The advantage of this model is that data is allowed to span if it doesn't fit in its allotted space. Unfortunately* DirectCD*'s new packet scheme requires more overhead on the disc itself than the previous version, so you won't be able to write as much data to disc.*



Please select a CD-Rewritable drive to erase the media inside.

CD-RW Drive	Device Id	Used by
Test (H:)	PHILIPSOMNIWRI...	Adaptec CD Eraser

Media:
CD-Rewritable disc with folders/files. All the data on this disc can be erased

Capacity: 683,819,008 bytes 652 MB

Click < Start > to erase the entire disc.

It will take approximately 2 minutes to 1 hour for processing.

Erasing disc, please wait...

Time Elapsed: 00:06:46

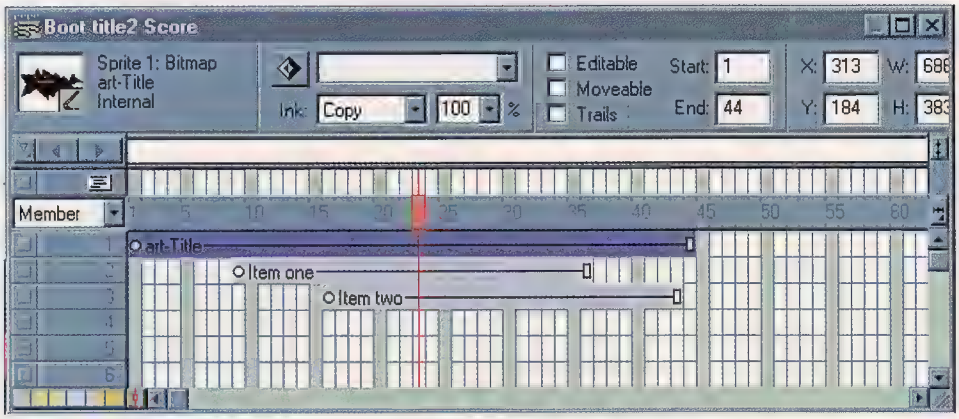
Our one complaint is that 2 minutes to an hour is an intolerably huge range of uncertainty when erasing.

Director 6.0

A surfer's delight

With version 6, *Director* sustains its position as the premiere tool for generating interactive media, especially on the web. Witness the full integration of Shockwave into *Director 6.0.* Not only does this let you build web-ready movies without exiting *Director,* but the *Director* compiler now understands all Internet-related Lingo functions.

In a move that shores up one of *Director*'s longest-standing weaknesses, sound and video files can now be synced to visual events in a movie. The author can set up cue points in a digital audio or video file (using an application such as *Sound Forge* or Adobe *Premiere*), and these can be addressed in a *Director* movie to keep the movie and media locked up. While this is far from the true, frame-accurate sync of film and video, it should significantly increase the realism of movies made in *Director.* A further delight is the incorporation of Shockwave audio into *Director* for compressing audio files by as much as 176:1 to allow them to play from the net or CD-ROM. Even Lingo has beefy Internet chops now, allowing you to link cast members and casts to media on the Internet the same way you've traditionally linked them to media on disk. Some of Lingo's new Internet-sensitive commands include: getNetText, preloadNetThing, gotoNetMovie, gotoNEtPage, downloadNetThing, and clearCache.



Sprite 1: Bitmap
art-Title
Internal

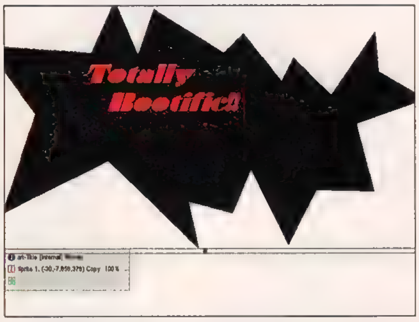
Ink: Copy
100 %

☐ Editable
☐ Moveable
☐ Trails

Start: 1
End: 44

X: 313
Y: 184
W: 68
H: 38

Director *now let's you set the duration of a sprite on the score by dragging its start and end points.*



The Sprite Inspector lets you see all the relevant information about a sprite right on the stage.

Director 6.0 imports JPEG, PNG, GIF, LRG (xRes), TIF, PhotoCD, WMF, FLC, FLI, IMA compressed, MacPaint, and Photoshop 3.0 files. Authors can launch, edit, and save these media files from within *Director,* and the application automatically re-imports edited files to the cast.

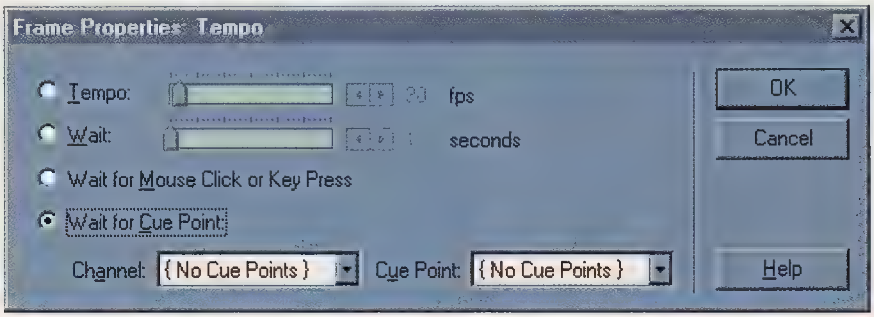
Version 6.0 is loaded with details bound to ease the author's workload. It brings in true, rotatable 3D models exported from *Extreme3D* in 3DMF format via the QuickDraw3D Xtra. Tedious tweening of sprites is no more: A sprite can now span multiple frames in the score, and the number of frames spanned can be changed by a simple click and drag. A version 6.0 movie can have up to 128 sprite channels, each displaying a playback indicator. The Score's new zoom and multiple views make it much more flexible; live Internet authoring relieves authors of the need to quit before testing; the new Behavior Inspector window aids sprite tweaking; there are 40 percent more help topics, and much more.

Streaming Shockwave

Shockwave can also stream movies off the net or from CD-ROM, so waiting for downloads is eliminated. And *Director* can create a ShockedCD, allowing you to play games using net and disc media to their best advantage: the game's intelligence comes from the web, while large media files such as graphics and sound come from the CD-ROM. In addition, browser scripting support for *Navigator* plug-ins and ActiveX mean you can start and stop movies when you want.

Version 6.0 of *Director* adds a lot of value for the multimedia author, including new Internet features and useful authoring functions.

— Tim Tully



○ Tempo: 30 fps
○ Wait: seconds
○ Wait for Mouse Click or Key Press
● Wait for Cue Point:

Channel: { No Cue Points }
Cue Point: { No Cue Points }

Director 6.0's *Tempo box keeps sound and visuals in sync by pausing the movie until a specific point in a sound.*

Price *Director 6.0 Studio $999 (includes Extreme 3D 2, xRes, Sound Forge XP)*
Studio Upgrade $499
Director-Only Upgrade $399
Developer/Publisher
Macromedia
Phone *800.326.2128*
URL *www.macromedia.com*

boot verdict 8

The 56K Question

Bum-rushing the new modem speed standard

SupraExpress 56e External

SupraExpress 56

Diamond has a great web site with useful charts, stats, and a listing of ISPs supporting K56flex (but, at the time, the ISP list featured only one Provider, Epoch Internet).

Diamond Multimedia's SupraExpress 56 series comes with all the high-end standards: Plug-and-Play installation, full-duplex speakerphone, caller ID, voicemail, and flash-ROM upgradability. The unit is video-phone ready and comes with Diamond's fax app, *FAXcilitate*. The box itself is teeny-tiny and aesthetically blah—and that's where the ho-hum stops.

K56flex and solid engineering are at the heart of the 56e. Diamond engineered the modem from scratch to specifically support K56flex. This means a new-and-improved datapump, DSP (digital signal processor), and crystal, as well as beefed-up SRAM—four times the amount in your regular old 33.6. All this translates into hardware that keeps pace with the K56flex chipset.

The DAA (Direct Access Arrangement) that receives and transmits the modem signal has been redesigned, and the DTE rate (the speed at which the modem sends information to the computer) is a respectable 230Kbps. Testing via Epoch Internet—it took forever to find an ISP, any ISP, that supported K56flex—ranged from 36Kbps to 53Kbps. In addition to good performance, Diamond runs a BackWeb channel for automatic driver updates. All in all, a very nice, speedy package.

boot verdict 7

Price $170
Company Diamond Multimedia
Phone 800.727.8772
URL www.diamondmm.com

Sportster 56K x2 Internal

U.S. Robotics' Sportster 56K ISA card is easy to install, but, compared to the K56flex modems, provides slightly sub-par performance numbers of 33Kbps to 48Kbps. Unlike the K56flex camp, x2 is ready for show time with a slew of ISPs to choose from. The USR x2 web site is a wellspring of valuable information, including a searchable list of x2-ready ISPs (including POPs, URLs, and customer service numbers), and line-test info to make sure you have an x2-capable connection.

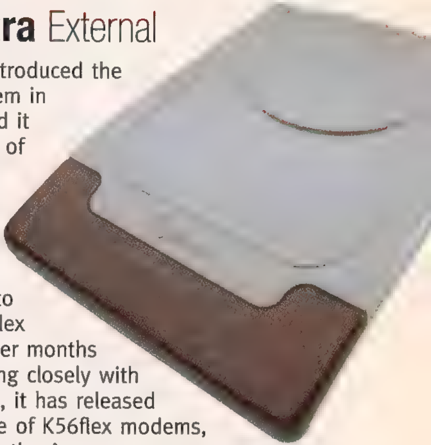
x2 modems use DSP Solutions technology from Texas Instruments, so they'll be flash-ROM upgradable to the ITU standard, assuming only software upgrades will be required (very likely). Of course, USR promises free upgrades by any means necessary to all who purchase an x2 modem, so the flash vs. hardware issue *is* irrelevant.

boot verdict 7

Price $199
Company U.S. Robotics
Phone 800.342.5877
URL www.usr.com

USR's CD-ROM goes far beyond AOL and CompuServe. There's a ton of software that you'd actually use, a COM test, and a setup wizard.

Accura External



Too bad the Accura CD-based reference doesn't include anything about the 56.6Kbps modem we reviewed (it did, however, feature AOL and CompuServe, which don't yet support K56flex!).

Hayes introduced the PC modem in 1981, and it was one of the first major manufacturers to commit to the K56flex spec. After months of working closely with Rockwell, it has released a full line of K56flex modems, including the Accura External.

The box was easy enough to install, although documentation is skimpy. The footprint is significantly larger than the SupraExpress (and equally ugly). It performs well with a peak throughput of 51Kbps and a low of 31Kbps.

Hayes has programs to upgrade absolutely any modem from any manufacturer to 56.6Kbps for $99. It doesn't even have to be a Hayes modem. The Accura is flash-ROM uprgradable.

This is a solid modem, although it doesn't have the star power of the SupraExpress or the ISP support of the Sportster 56K.

— *Lauren Guzak*

boot verdict 6

Price $169
Company Hayes
Phone 800.445.3687
URL www.hayes.com

SPEED TESTING

Because of line noise on local copper, all modem manufacturers say most 56.6Kbps users will connect in the mid-40Kbps range. If you're stuck in the low 30s, ask your telco for a modern line. If you're hitting 50s, consider yourself blessed. Using a single control system, we tested each modem in the morning and evening during five consecutive days, for a total of 10 log-on tests per modem.

Modem	Chipset	Log-on Speeds (Kbps)	Price
SupraExpress 56e External	K56flex	53 high; 36 low	$170
Sportster 56K Internal	x2	48 high; 33 low	$199
Accura 56K External	K56flex	51 high; 31 low	$169

Micron **Millennia MME** with Fusion 3D

A multimedia hit and miss

The Millennia MME almost lives up to its billing as an "ultimate gaming machine." But the Fusion 3D—a snazzy moniker describing the Stealth 3D 2000 Pro and Monster 3D video cards lurking inside—provides more confusion than fusion, robbing the Millennia of a potential Kick-Ass award.

Thanks, in part, to temperamental video drivers supplied for the irritating ViRGE DX-equipped 2D video solution, the Millennia has a hard time playing full-screen AVI video. Stretched to 640x480 or at full-screen, the ViRGE DX spits out a grotesque double image adorned with even uglier black-and-white stripes. Not good. (Although the frame rate is terrific, with zero frames dropped!) The engineers at Micron, bless their hearts, tried to resolve the problem by supplying updated drivers, but to no avail. Next we called Diamond, who supplied newer drivers (version 3207), which fixed the imaging problem, but resulted in more than 80 percent of the frames being dropped, accompanied by at least 26 audio breaks. Ugh. (MPEG playback fared much better—the slightly pixelated images played back at a reasonable 24fps.)

To make matters worse, when we clicked on the info tab in Diamond's Display Control Panel another driver bug crashed the system about 25 percent of the time. Both Diamond and Micron promised to resolve these issues in their next software updates, and rest assured, we'll hold 'em to it.

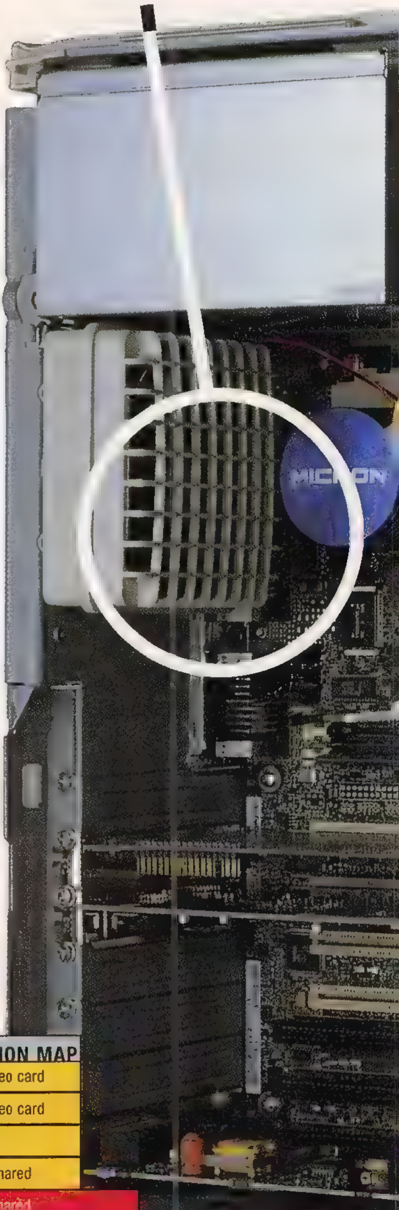
Another of the Millennia's disappointments is its onboard OPL3-SA audio solution. Although it's bona fide Sound Blaster compatible, the MIDI-compliant SoftSynth wavetable synthesizer is middling at best. Our tests—consisting of playing back *Ultima 8* soundtracks originally mapped to a Roland SCC1 GS—revealed muted pianos, cheesy trumpets, and violins inexplicably missing in action. The choir effect, in particular, fell way short of actually being spooky.

However, lest you get the wrong impression, not everything about the Millennia MME is doom and gloom. Its performance, for the most part, is boffo. During a game of *GLQuake* for example, the Millennia reaped a most excellent 28.4fps (15.4fps in the plain-vanilla version), and thanks in part to the ever-cool 3Dfx Voodoo chipset, the Millennia's Direct3D performance was almost as fast as a Pentium II 266MHz powerhouse. The 233MHz CPU provided the punch to drive the MMX applications, and the CD-ROM and hard drive performed very respectably.

Deep inside, the Millennia is a joy to behold. The Intel AN430TX ATX formfactor motherboard is unobstructed, and is accompanied by a proprietary heat sink and fan design (the fan's hidden behind a cage). Two USB ports and two free PCI slots are also present and accounted for. The 19-inch large-screen Hitachi monitor, U.S. Robotics' Sportster 56.6Kbps internal modem, Advent satellite/subwoofer speakers, SideWinder Pro joystick (but sadly, no multiplayer game pads), *and* an Iomega Zip drive (handy for transferring your collection of illicit gifs) are all included in the sub-$3,500 price tag, adding extra zest to this already appealing package.

As it stands, the Millennia MME w/Fusion 3D is a powerful entity that can be made even better.

— Bryan Del Rizzo



CAGED HEAT
Check it out... the extra fan is enclosed in a vented cage. Also notice the easy access to the DIMM sockets and PCI slots.

under the hood

THE BRAINS

CPU	Intel Pentium 233MMX (P55C)
L2 Cache	512K (external pipeline burst)
RAM	32MB DIMM (128MB maximum)
Motherboard	Intel AN430TX ATX formfactor

THE BRAWN

Video	Diamond Stealth 3D 2000 Pro (S3 ViRGE K233) with 4MB EDO-VRAM; Diamond Monster 3D (3Dfx Voodoo) with 4MB EDO DRAM
Hard Drive	Quantum Fireball ST 3,2GB ATA
CD-ROM	Hitachi 8330 24X IDE
Expansion Bus	Four PCI; three ISA; one PCI/ISA shared
Fax/Modem	U.S. Robotics Sportster 56.6Kbps
I/O Ports	Two USB; two serial; one parallel

THE BEAUTY

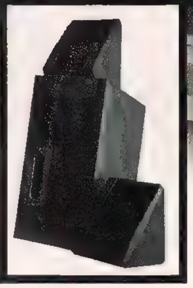
Display	Hitachi CM751U; 19-inch screen size; 1600x1200@75Hz
Sound	OPL-3A FM-synthesis/wavetable chipset
Speakers	Advent AV370 (two 10W satellites, 30W subwoofer)
Other	Iomega Zip drive, Microsoft SideWinder Pro joystick

EXPANSION MAP

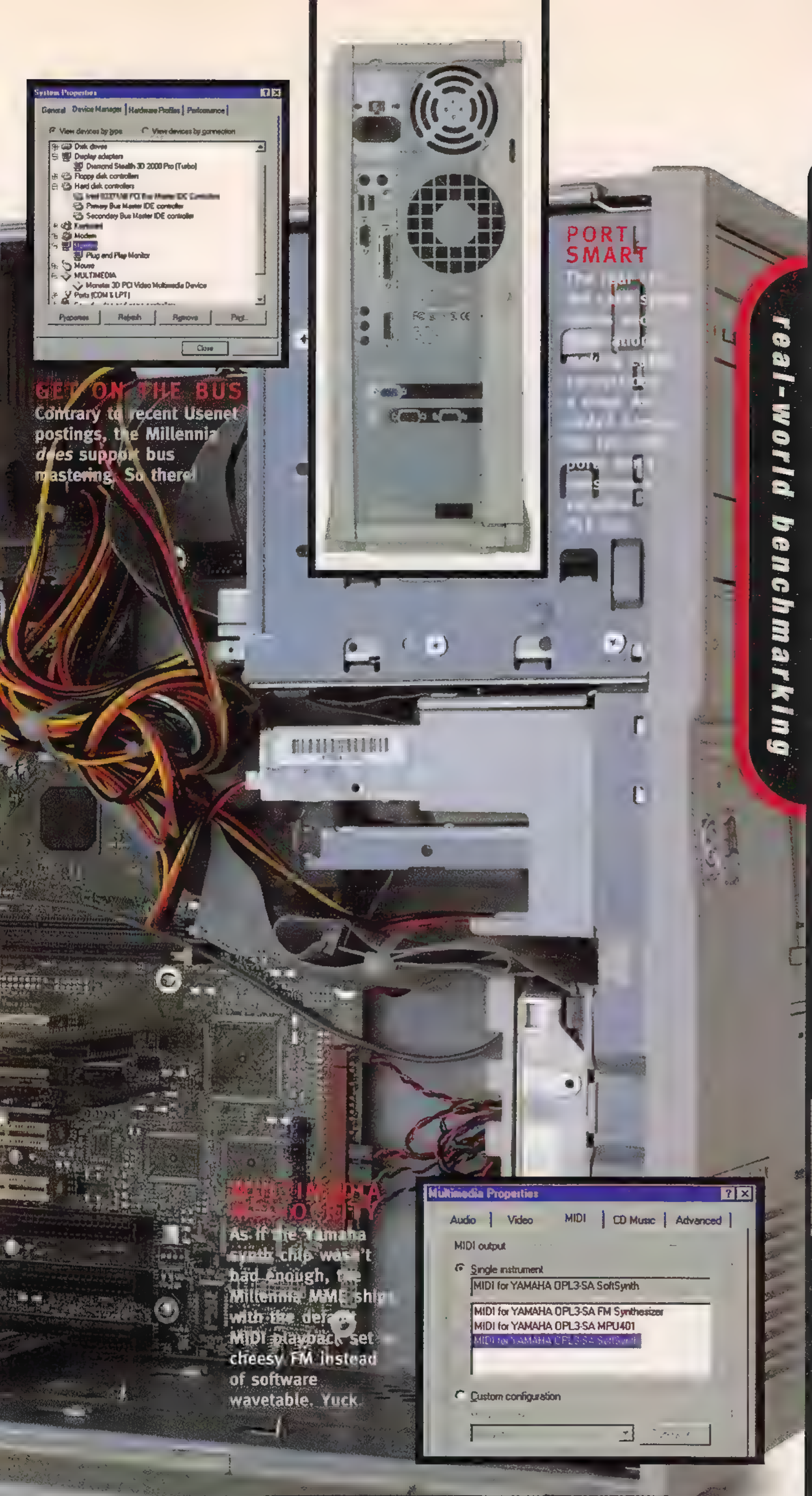
PCI	2D Video card
PCI	3D Video card
PCI	Free
PCI	Free/shared
ISA	Free/shared
ISA	Free
ISA	Modem

THE BUNDLE Office 97 SBE ❙ Command & Conquer Gold ❙ Formula 1 ❙ MechWarrior 2: Mercenaries (3Dfx) ❙ Longbow Gold ❙ U.S. Navy Fighters 97 ❙ Pod (MMX, 3Dfx) ❙ Eraser Turnabout (MMX) ❙ Blockbuster Guide to Movies & Videos 2nd Edition (MMX) ❙ Billboard Music Guide (MMX) ❙ Adobe PhotoDeluxe

boot	*down*
:45	:03



CRANK IT UP BABY
The Advent speakers provided just enough oomph, without consuming inordinate amounts of desk space.



System Properties

General | Device Manager | Hardware Profiles | Performance

☑ View devices by type ○ View devices by connection

- Disk drives
- Display adapters
  - Diamond Stealth 3D 2000 Pro (Turbo)
- Floppy disk controllers
- Hard disk controllers
  - Intel 82371AB PCI Bus Master IDE Controller
  - Primary Bus Master IDE controller
  - Secondary Bus Master IDE controller
- Keyboard
- Modem
- Monitor
  - Plug and Play Monitor
- Mouse
- MULTIMEDIA
  - Monster 3D PCI Video Multimedia Device
- Ports (COM & LPT)

Properties
Refresh
Remove
Print...
Close

GET ON THE BUS

Contrary to recent Usenet postings, the Millennia *does* support bus mastering. So there!

PORT SMART

[illegible]

MULTIMEDIA MEDIOCRITY

As if the Yamaha synth chip wasn't bad enough, the Millennia MME ships with the default MIDI playback set cheesy FM instead of software wavetable. Yuck.

Multimedia Properties

Audio | Video | MIDI | CD Music | Advanced

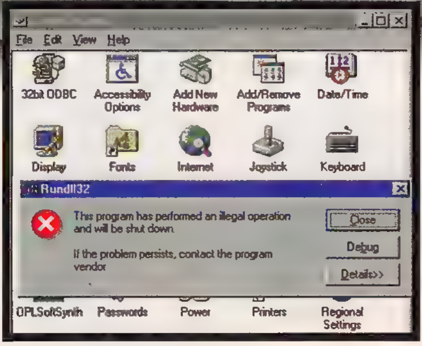
MIDI output

● Single instrument

MIDI for YAMAHA OPL3-SA SoftSynth

- MIDI for YAMAHA OPL3-SA FM Synthesizer
- MIDI for YAMAHA OPL3-SA MPU401
- MIDI for YAMAHA OPL3-SA SoftSynth

○ Custom configuration



File Edit View Help
32bit ODBC
Accessibility Options
Add New Hardware
Add/Remove Programs
Date/Time
Display
Fonts
Internet
Joystick
Keyboard
OPLSoftSynth
Passwords
Power
Printers
Regional Settings

Rundll32

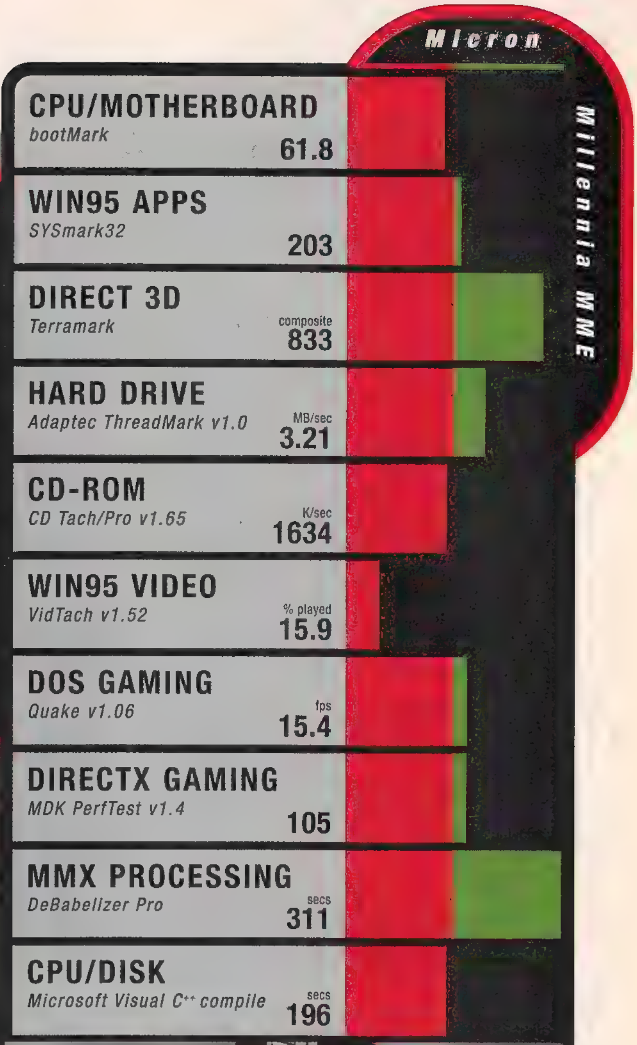
This program has performed an illegal operation and will be shut down.

If the problem persists, contact the program vendor.

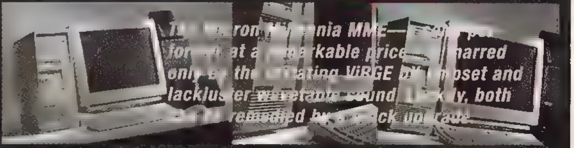
Close
Debug
Details>>

ON THE VIRGE OF INSANITY

Every time we tried to open the Display Properties window in the Control Panel, a not-so-friendly Win95 error reared its ugly head.



Test	Benchmark	Unit	Score
CPU/MOTHERBOARD	bootMark		61.8
WIN95 APPS	SYSmark32		203
DIRECT 3D	Terramark	composite	833
HARD DRIVE	Adaptec ThreadMark v1.0	MB/sec	3.21
CD-ROM	CD Tach/Pro v1.65	K/sec	1634
WIN95 VIDEO	VidTach v1.52	% played	15.9
DOS GAMING	Quake v1.06	fps	15.4
DIRECTX GAMING	MDK PerfTest v1.4		105
MMX PROCESSING	DeBabelizer Pro	secs	311
CPU/DISK	Microsoft Visual C++ compile	secs	196



The Micron Millennia MME—[illegible] for [illegible] at a remarkable price—is marred only by the irritating ViRGE DX chipset and lackluster wavetable sound. Luckily, both can be remedied by a quick upgrade.

+	−
233 MMX CPU	Pesky ViRGE DX drivers
19-inch monitor	Inferior sound
Zip drive	No game pads included
3Dfx Voodoo	No real-mode drivers installed
Sensible case/motherboard design	MIDI properties default to FM-synth instead of software wavetable
Robust hard-drive performance	
USB ports	

Price $3,299 w/ 19-inch
Company Micron
Phone 800.209.9686
URL www.micronpc.com

boot verdict 7

A complete breakdown of benchmark results is available on the *bootNet.* Point your browser to www.bootnet.com

Painter 5

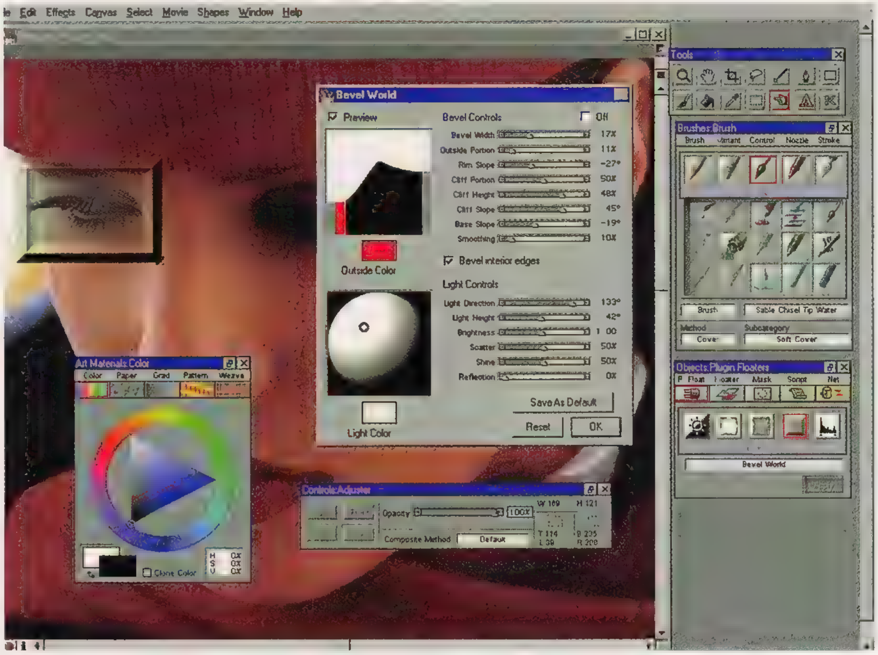
Effects overload: You gotta pay to play

Painter's blessing is its bane. The amazing app that mimics all the properties of natural media has always suffered from palette overload. Simple little projects become Serlingesque nightmares of palettes within palettes, and just to get to your document you must constantly rearrange the miasma.

But that's the price you pay for groundbreaking special effects, and *Painter* 5 proves it's still a price worth paying. At its core the program relies on two feature sets—brushes and art materials—to ape real-world media. For example, when you use a brush such as Oil Pastel Chalk on an art material such as Raw Silk, the grain of the silk is visible through the chalk strokes (at least until you apply a few more coats, effectively covering the silk threads). Try the same thing with watercolors, and your strokes soak into the silk and never cover the threading—because in real life, watercolors are thin and runny, and chalks are thick and gloopy.

It's as fascinating as it sounds, and natural media mimicry is only the beginning of *Painter*'s wonder. New special effects of all creeds and colors are hidden throughout version 5's interface. Go to the Pop Art Fill menu to apply Benday dots à la Roy Lichtenstein; go to the Objects palette to superimpose a kaleidoscopic lens over any part of your source material; go to the Focus menu to add glass distortion to an image so it looks like it's hiding behind a glass shower curtain. Of course, you'll feel the pain when you try to locate every palette and dialog box necessary to build composite effects, but what do you want, "Baby's First Illustration Program"?

Version 5's most significant feature is a long-overdue plug-in architecture for brushes and floaters. *Painter* has always shipped with the coolest brushes in the software universe, ranging from ultra-realistic (such as felt markers that get dark and mucky where strokes intersect) to fantastic (such as tools that automatically render in the style of Van Gogh or Seurat). The new version comes with sample plug-in libraries that demonstrate what lies ahead when third-party developers begin distributing their own brushes. Notable pack-ins include Super F/X brushes that paint in fire, bubbles, and glowing auras; Gooey brushes that bulge, pinch, and twirl pixels; and Photo brushes that give you traditional lab effects with all the freedom (and localized precision) of a pen stroke.


Edit Effects Canvas Select Movie Shapes Window Help
Tools
Brushes: Brush
Brush Variant Control Nozzle Stroke
Objects: Plugin Floaters
Bevel World
Art Materials: Color
Color Paper Grad Pattern Weave
Clone Color
Controls: Adjuster

Bevel World

☑ Preview

Bevel Controls ☐ Off

Bevel Width 17%
Outside Portion 11%
Rim Slope -27°
Cliff Portion 50%
Cliff Height 48%
Cliff Slope 45°
Base Slope -19°
Smoothing 10%

Outside Color

☑ Bevel interior edges

Light Controls

Light Direction 133°
Light Height 42°
Brightness 1 00
Scatter 50%
Shine 50%
Reflection 0%

Light Color

Save As Default

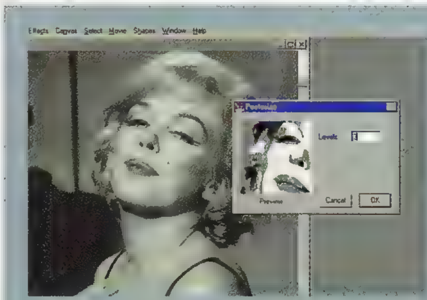
Reset OK

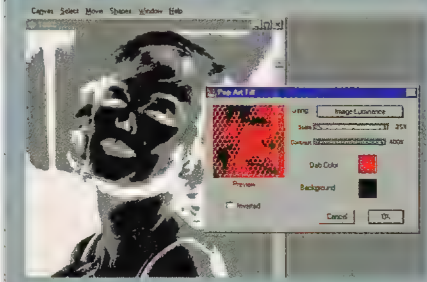
Opacity 100%
Composite Method Default

By the time you open your first non-essential palette, your screen is littered with windows. Many important functions are hidden three or four levels deep, but at least the results are chill.

How cool are brushes? Imagine being able to paint—yes paint—with filters à la Adobe *Photoshop*. Yes, *Painter* 5 adds wonderful support for special effects.

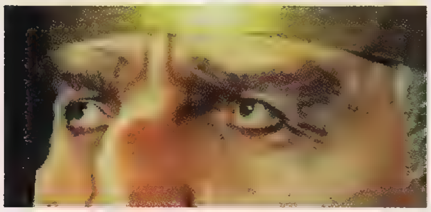
Painter's new Floaters are similar to ayers in *Photoshop*. They sit atop your canvas like transparent panes and allow you


Effects Canvas Select Movie Shapes Window Help
Posterize
Levels
Preview
Cancel
OK

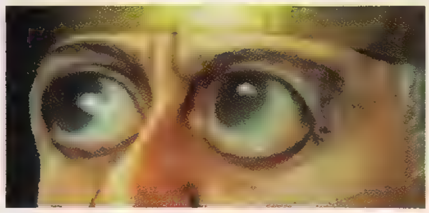

Canvas Select Movie Shapes Window Help
Pop Art Fill
Using Image Luminance
Scale 25%
Contrast 400%
Dot Color
Background
Preview
Inverted
Cancel
OK

Making Kings into Jesters

Painter's new Gooey plug-in brushes are brutally comic. Want to dehumanize a head of state? Give him a beady-eyed look with the Pinch brush or make him bug-eyed with two simple strokes of the Bulge brush (just gently sweep your mouse or pen vertically down the length of each eye).

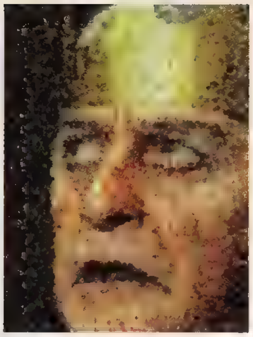


"Do you think mascara might bring my eyes out?"

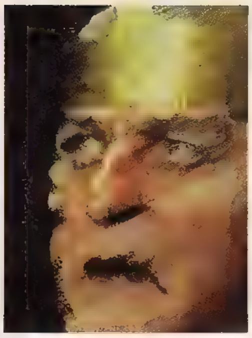


"For I am Reggie, king of newts."

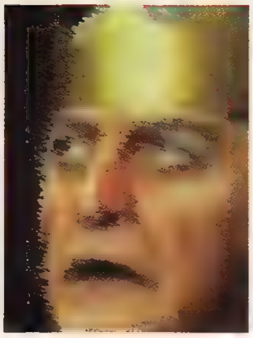
The original cloning source.



Auto cloned using the Seurat tool in the Artists library.



Auto cloned using the Palette Knife in the New Paint Tools library.



Auto cloned using Gritty Charcoal in the Charcoal library.

Fine Art in a Flash

Turning regular old photographs into rendered fine art is wicked easy with Painter 5*. Just use the Auto Clone effect.*

1 *Open your source image.*

2 *Go to the File menu and choose Clone (a clone of the original will appear).*

3 *Choose a brush in the Brushes palette—say, the Seurat brush in the Artists library.*

4 *Go to the Art Materials palette, choose Color, and click on the Clone Color box so that you'll be rendering with all the color properties of the original image.*

5 *Go to the Effects Menu, pull down to Esoterica and choose Auto Clone.* Painter *will begin rendering your cloned image in the style of Seurat. When you're happy with the degree of rendering, click within the image, and the engine will stop. Boom! You're an old master.*

6 *Auto Clone produces varying effects with the different brushes, and with each brush's particular methods, subcategories, and fine slider controls. Just remember that* Painter *mimics natural media. With brushes such as crayons and pens, you must use the "cover" method instead of the more realistic "build-up" method or your image will quickly become a muddy mess.*

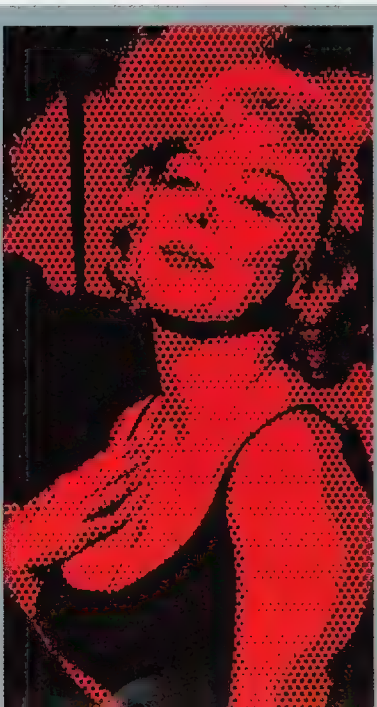
to make sweeping changes to specific image selections without altering the original pixels underneath. The plug-in floaters shipping with version 5 are essentially special effects engines. One floater renders beveled interface buttons with a single mouse click, achieving quick results that would otherwise require lots of time (and steps) in another program. Liquid Metal, another new floater, facilitates painting with a substance that resembles mercury. Sure, it's a nifty little effect—especially when you use the metal to reflect an imported environment map—but most artists will either find it irrelevant or abuse it through overuse. Unfortunately, *Painter* 5 includes only 11 plug-in floaters (a paltry number compared to the new brush count), and some merely replicate effects already available on the canvas level.

Many web designers have already embraced *Painter* for its ability to transform stock (and even stolen) imagery into "original" artwork. The latest version offers even better web support, including killer GIF animation features (no external animator necessary), and easy-to-use tools for creating image maps, fractal patterns, and seamless repeating background tiles.

Print designers will appreciate the program's inclusion of the Kodak Color Management System, which gives you previews of how your document should look when printed to a specific output device (20 device profiles install during the default installation). If you prefer doing all your separations from Adobe *Photoshop* you'll dig the special "Photoshop RGB to CMYK" profile that previews how *Photoshop* will handle sep conversion. *Painter* also includes Pantone Hexachrome support for six-plate seps, but if you want to output any sep directly from *Painter*, you must save as an EPS. The program can also save native files to TIFF, PICT, Photoshop, BMP, PC Paintbrush, Targa, GIF, JPEG, and Pyramid. It can also open all these formats, as well as AVIs and Adobe *Premiere* Frame Stacks.

Despite its control-freak interface, *Painter* 5 is another winner in Fractal Design's lineage of power tools. In fact, if all your *Photoshop* work has been geared toward special effects rather than traditional photo retouching, you should switch to *Painter* entirely (and if you're a magic-wand fiend, you'll appreciate *Painter*'s new real-time tolerance slider—it blows away *Photoshop*'s less-interactive implementation). *Painter*'s $99 upgrade is definitely worth the money, considering version 5's potential for third-party plug-in activity. Just wait until Microsoft releases Memphis with its dual-monitor support, and then drag all your bothersome control palettes to your old 14-inch monitor.

– Jon Phillips



Pop Goes the Easel

Painter 5*'s pop-art effect lets you use an image's luminance properties to generate graduated Benday dots.*

1 *Open your source image and reduce its color count by going to the Effects menu, pulling down to Tonal Control, pulling over to Posterize, and choosing a small value, say between 3 and 6.*

2 *Go back to the Effects menu and select Negative. Let go. Your image is now ready for the Benday dots, which thrive on negativity.*

3 *Once more in the Effects menu, pull down to Esoterica, pull over to Pop Art Fill, and choose the following settings: Using: Image Luminance; scale: 25%; Contrast: 400%; Dab Color: red; Background: black. Now hit OK.*

4 *Try selecting specific parts of an image and give each its own color scheme and dot size (big dots in the background, small dots in the foreground).*

Price $300
Developer/Publisher
Fractal Design
Phone 800.846.0111
URL www.fractal.com

boot verdict 8

NEC Versa **6200MX**

A looker, not a keeper

The Versa 6200MX's older brother, the 6050MX, was reviewed in *boot* 09 and it fared pretty well. So when the Versa 6200MX appeared on the doorstep, expectations were high, especially because the 6200MX incorporates an eye-boggling (Versa's words, not ours) 13.3-inch display. Unfortunately, the 6200 also comes with a mind-boggling (our words, not theirs) $5,700 price tag.

The high price point could be justified if the 6200MX were revolutionary in its design and performance. But guess what? It's not. In fact, except for that extra-large display (exhibiting zero flex) and 166MHz MMX processor, nothing else about the 6200MX is even remotely exciting.

The video chipset—the overused Chips and &Technologies CT65550—produces abysmal, pathetic, god-awful AVI and MPEG playback in both full screen and smaller windows. The frame rate is atrocious, and the number of frames skipped and audio breaks witnessed (not to mention severe pixelation, masking, and distorted colors) are enough to make us cry. The audio subsystem, consisting of an ESS 1878 chip, is register-compatible with Yamaha's OPL3, but it's FM-only. Sigh.

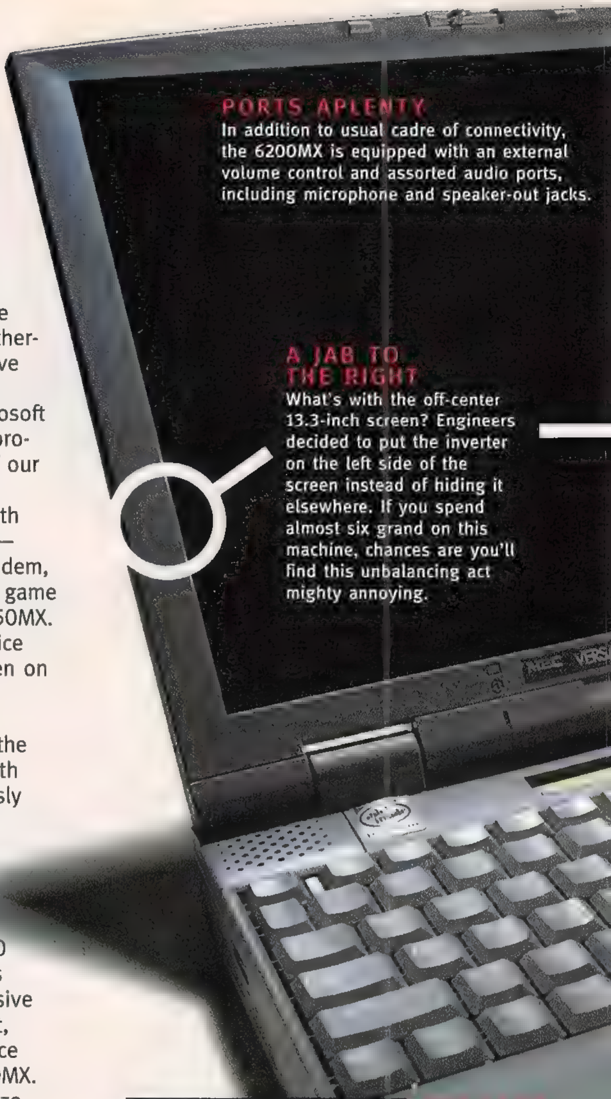
To add insult to injury, components that scored well during our benchmarking proved problematic during real-world tasks. The most serious offenders were the 10X CD-ROM (with an awesome 1526K/sec transfer rate) and the 2.1G hard drive, both of which vomited repeatedly when attempting to copy graphics files larger than 60MB. DOS gaming was cursed as well: Whenever we tried to run *Quake* at 640x480 after restarting in DOS, the 6200MX responded by rebooting. (We completed our tests in a DOS shell instead.)

Still, with a 166MHz MMX processor providing the power, performance is good but not earth-shattering. The bootMark score of 43.2 (testing motherboard and CPU performance) is above average, as is DirectX gaming. Real-world tests in *DeBabelizer Pro*, Microsoft C++, and other Win95 applications produced good scores, but fell short of our tough averages.

Our biggest disappointment is with NEC's decision to drop components—including a built-in 33.6Kbps fax/modem, dual infrared ports, and regular-size game port—that were included on the 6050MX. The addition of a TV-out jack is a nice touch, but the port should have been on the rear of the unit.

After taking the 6200 out for a spin, we recommend you stick with the 6050MX. Sure, you may be stuck with a lowly 12.1-inch display and a measly 150MHz MMX processor, but you'll save yourself 500 bucks, and score a 33.6Kbps modem and game port in the process. If you really must have that 166MHz MMX processor, check out the Compaq Presario 1080 (also reviewed in *boot* 09). It comes equipped with a much more impressive NeoMagic MagicGraph 128ZV chipset, provides top-notch video performance and costs $1,100 less than the 6200MX.

— Bryan Del Rizzo



PORTS APLENTY
In addition to usual cadre of connectivity, the 6200MX is equipped with an external volume control and assorted audio ports, including microphone and speaker-out jacks.

A JAB TO THE RIGHT
What's with the off-center 13.3-inch screen? Engineers decided to put the inverter on the left side of the screen instead of hiding it elsewhere. If you spend almost six grand on this machine, chances are you'll find this unbalancing act mighty annoying.

under the hood

THE BRAINS	
CPU	166MHz Intel Pentium with MMX
L2 Cache	256K (pipeline burst)
RAM	32MB EDO-DRAM (128MB maximum)
Video	Chips & Technologies CT65550 (2MB DRAM)
THE BRAWN	
Hard Drive	2.1GB Toshiba IDE
CD-ROM	10X Toshiba
Expansion Bus	Two Type II PC; one Type III PC; CardBus and Zoomed Video compatible
I/O Ports	One serial; one parallel; monitor; PS/2 keyboard/mouse combo; TV-out
Lap Weight	8 pounds
Carrying Weight	9 pounds, 10 ounces
THE BEAUTY	
Display	13.3-inch active-matrix screen
Sound	ESS 1878 Sound Blaster-compatible FM-synth
Video	1024x768, 16-bit color
Speakers	Stereo speakers
Communication	Fax/modem not included

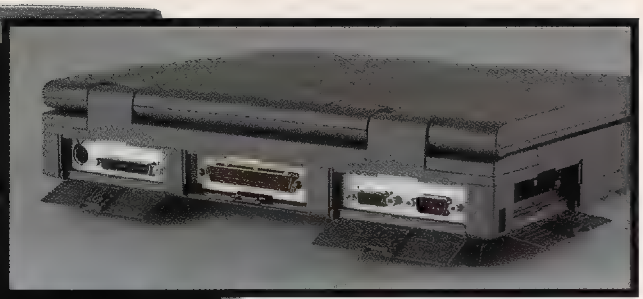
REAL-WORLD BATTERY LIFE 01:39:48

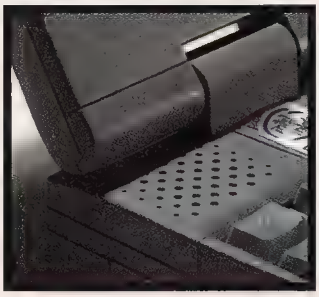
THE BUNDLE Laplink for Windows95 | McAfee VirusScan95 | McAfee WebScan | Mediamatics MPEG Arcade Pack | Netscape Navigator | Online Services | Official Airline Guide | Star Trek: First Contact Video Saver CD | XingMPEG Player

boot :52 *down* :05

FAN CLUB FOR MEN
This is kinda interesting: You can actually see (and feel) the fan keeping 6200MX cool inside—and it's a good thing, too, the 6200 runs very hot.

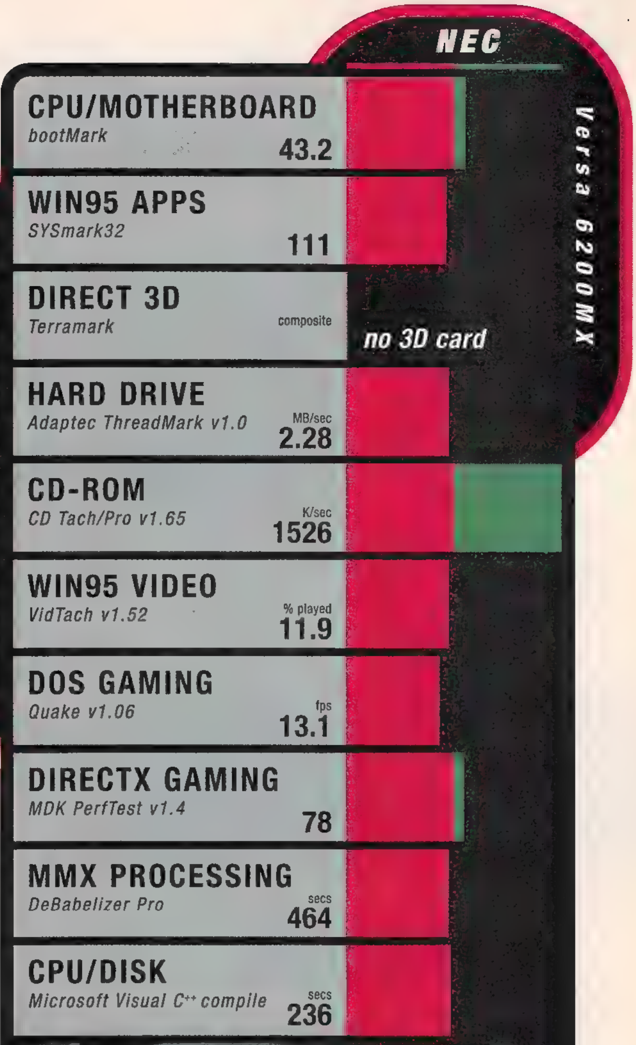
SEE HERE
The 6200MX includes the requisite LCD displaying power management, battery life, and more.



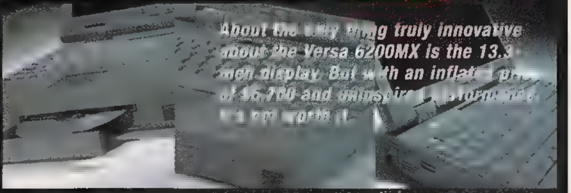


MUSIC TO YOUR EARS
The speakers are intelligently positioned, and there's even a built-in microphone at the front.

MOVE IT, DON'T LOSE IT
One of the 6200MX's nicer features is easy access to the removable hard drive. Although, with 2.1GB of storage and good performance, you probably won't want to replace it anytime soon.



Benchmark	Test	Unit	Result
CPU/MOTHERBOARD	bootMark		43.2
WIN95 APPS	SYSmark32		111
DIRECT 3D	Terramark	composite	no 3D card
HARD DRIVE	Adaptec ThreadMark v1.0	MB/sec	2.28
CD-ROM	CD Tach/Pro v1.65	K/sec	1526
WIN95 VIDEO	VidTach v1.52	% played	11.9
DOS GAMING	Quake v1.06	fps	13.1
DIRECTX GAMING	MDK PerfTest v1.4		78
MMX PROCESSING	DeBabelizer Pro	secs	464
CPU/DISK	Microsoft Visual C++ compile	secs	236



About the only thing truly innovative about the Versa 6200MX is the 13.3-inch display. But with an inflated price of $6,700 and uninspired performance, it's not worth it.

+
- 13.3-inch screen
- 166MHz Pentium Processor with MMX
- Speedy 10X CD-ROM drive
- CardBus and Zoom Video compatible

−
- Inconsistent performance
- Heavy carrying weight
- Lousy MPEG and AVI playback
- No USB ports
- No game port
- CD-ROM has problems with large files

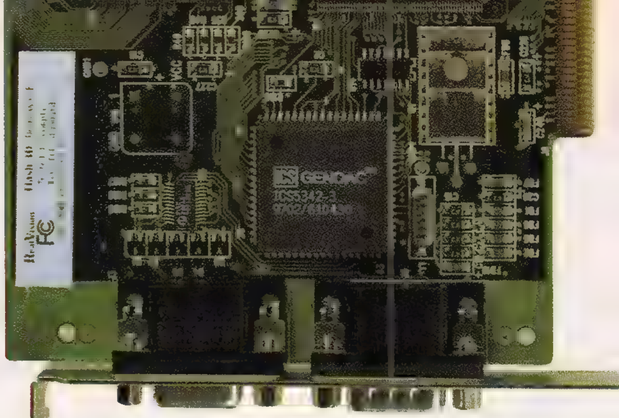
Price $5,699
Company NEC Computer Systems
Phone 800.632.4636
URL www.nec.com

boot verdict 5

A complete breakdown of benchmark results is available on the *bootNet.* Point your browser to www.bootnet.com

RealVision **Flash 3D**

Cheap Voodoo



Just plug your 2D card into the Flash 3D, and the Flash 3D into your monitor, and you're set for 3D Voodoo ecstasy.

6
THIS LAP
TAG HEUER Official Timing

Psygnosis' **Formula F1** *looks stunning on the 3Dfx Voodoo chipset found on Flash 3D.*

The 3Dfx Voodoo chipset has become the standard by which other 3D accelerators are judged, and all the best games are being written with the Voodoo in mind. It's a 3D-only chipset that gets its speed from two separate memory systems: 2MB for a frame buffer and 2MB for textures. Though not as flexible as dividing memory as needed, there's no denying the Voodoo's speed.

The Flash 3D works with any 2D card, and fills the entire screen. The upside: blazing 3D; the downside: your system is wasting memory on two separate frame buffers and you can't accelerate 3D in a window (so much for VRML). The Flash 3D must be adjusted for your preferred refresh-rate settings and gamma, and this can be a chore because the Flash 3D doesn't include a display utility. Thankfully, the defaults are tolerable, otherwise you're forced to delve into the Windows Registry to make changes.

If the Voodoo-based cards from Diamond and Orchid still cost $299, then—at half that price—the Flash 3D would be a shoe-in automatic Kick-Ass product. But now that the Diamond Monster 3D is selling for $199 with a huge software bundle and optimized drivers, and the Orchid Righteous 3D has dropped to $179, it just doesn't seem worth sacrificing all the frills to save a few pennies with the Flash 3D. But maybe you'd rather edit the Registry than use a display utility.

— *Chris Dunphy*

Flash 3D

Maximum 3D Resolution	640x480 (with Z-buffer) 800x600 (w/o Z-buffer)
Terramark (Level 1/2/3/total)	281/281/275/837
Ziff-Davis 3D WinBench	131

Price *$149*
Company *Deltron Technology*
Phone *519.734.8032*
URL *www.deltrontech.com*
Bundle *None*

boot verdict 8

PageMaker 6.5

Doctor layout and mister HTML

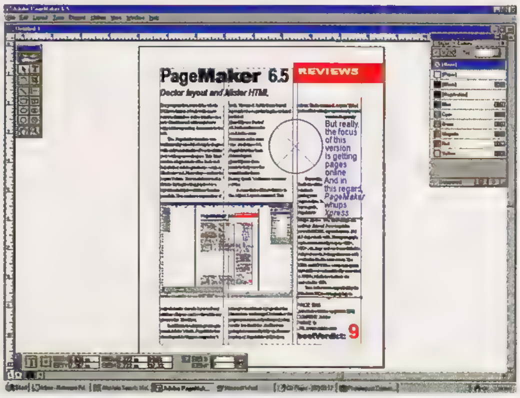
The program that started the DTP revolution is back with a new version that takes the interface in a new direction and adds major support for exporting documents to the web.

The *PageMaker* interface was traditionally a model of simple elegance with only a minimal toolbox to clutter your wide-open workspace. The latest version adopts much of the look and feel of other Adobe products—such as *Illustrator* and *Photoshop*—with features such as the Layers Palette. This useful tool is akin to laying tracing paper over a layout so multiple variations are possible. You can have any number of page elements on each layer and any number of layers can be viewed in any order. Excellent.

In addition to adopting surrogate parent Adobe's look, *PageMaker* has also adopted its biggest competitor's look. Version 6.5 adds frame-based layout for those preferring the ordered model of *QuarkXpress.* Best of all, both modes can be used in the same document simultaneously (but not the same text flow). Since 6.0, *PageMaker* has been able to import *QuarkXpress* documents to help ease the transition for those fleeing *Quark*'s infamous customer service.

A somewhat odd new feature is the Adjust Layout command. This attempts to reformat a page after the dimensions are changed, but unless the proportions are nearly identical, the result is a shambles. Beware, going in, to manually tidy up, because a robust Undo command (forget multiple-level undo—most object manipulations can't be undone) is still absent from the new version of *PageMaker,* so you'll have to revert to a previously saved version.

But really, the focus of version 6.5 is getting your pages online. In this regard, *PageMaker* whups *QuarkXpress.* You'd have to buy *Beyond Press* to get the powerful HTML export features *PageMaker 6.5* ships with. Now, paragraph styles automatically map to ‹H1›, ‹H2›, etc. tags and can be modified to suit your needs, but typefaces are still overlooked in the conversion. The TIFFs and EPS files common to print layout files are automatically converted to JPEGs, while most others are converted to GIFs.


PageMaker 6.5
REVIEWS
Doctor layout and Mister HTML
But really, the focus of this version is getting pages online. And in this regard, PageMaker whups Xpress
bootVerdict: 9

If you're taking your print pages online, the latest version of PageMaker *is the choice for you. But beware:* QuarkXpress 4.0 *is just around the corner.*

Toss in compatibility for Windows NT, a stronger plug-in architecture, and vastly improved color management, and *PageMaker 6.5* makes a more than fair tradeoff in simple grace for the muscle it has put on.

— *Brad Dosland*

Price *$849 (upgrade $99)*
Company *Adobe*
Phone *800.492.3623*
URL *www.adobe.com*

boot verdict 9

Dungeon Keeper

It's a good day to be a bad guy

boot KICK ASS! PRODUCT

You're a Dungeon Keeper, an arch villain with attitude, in Bullfrog's aptly named *Dungeon Keeper.* Combining micromanagement, real-time combat, and god-simulation you must design the perfect catacomb while killing bands of roving goodniks who are trying to raid your dank paradise.

Using a modified version of Bullfrog's *Syndicate Wars* gaming engine, *Dungeon Keeper* plants you deep within the bowels of the underworld with one of three viewpoints: a traditional isometric-perspective overhead vantage point; a three-quarter, fully rotational and scalable isometric view of the texture-mapped polygon world; and a first-person perspective. Each map can push up to 2,000 polygons.

Control any minion and move around, viewing your cohort's antics from several viewpoints. Inhabit the body of an imp, and your viewpoint is low and your movements nimble, or possess a fly and watch the world from a crazy kaleidoscopic multilense perspective.

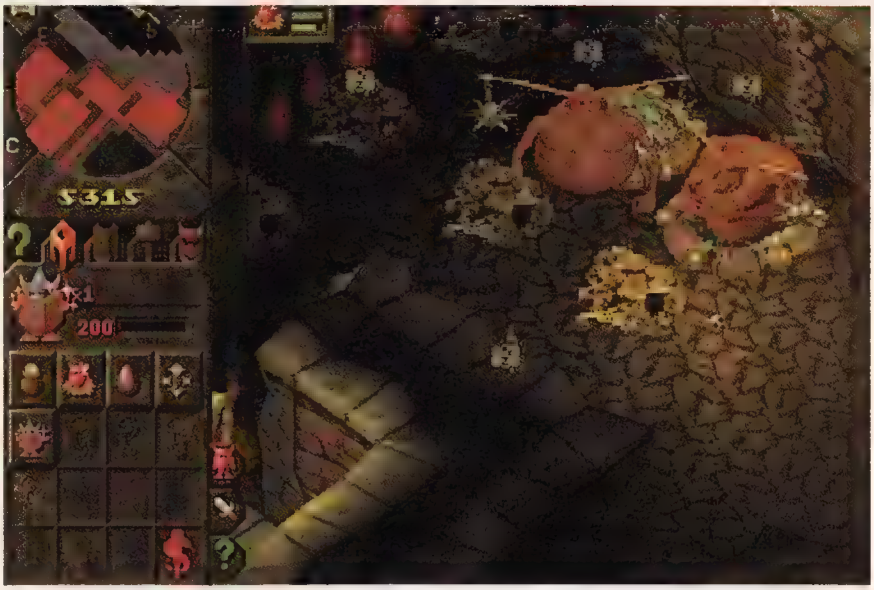
Dungeon Keeper runs at 18fps to 20fps on a P200 MMX, but you may find yourself cursing the speed—it gets too hectic when the gore spills.

Effects such as semitransparent clouds, the crimson flames marking the boundaries of your domain, perspective-correct shadowing, and localized light sourcing make the darkened recesses of your dungeon even more realistic. *Dungeon Keeper*'s low-res 32x32 texture maps look grand from afar, but degenerate up close—hardware 3D acceleration would fix that problem.

Beyond that, more than 2,000 frames of animation per beastie bring the *3D Studio Max*-rendered sprites to life and you feel like you're spying on living, breathing entities as you watch your lowly but loyal imps skitter down damp corridors, and warlocks fling their arms in the air releasing multicolored energy. But that pesky pixelation gets in the way—especially in first-person jaunts—and the low-color sprites range in resolution from 60x60 to 200x160 and look blocky up-close. Bilinear filtering, you're our only hope—a Direct3D patch is in the works.

CHECKLIST

Maximum Resolution/Color
640x400/8-bit
MS-DOS Native
Win95 Native
DirectX
DirectDraw DirectSound
DirectInput
Multiplayer
Modem Serial IPX

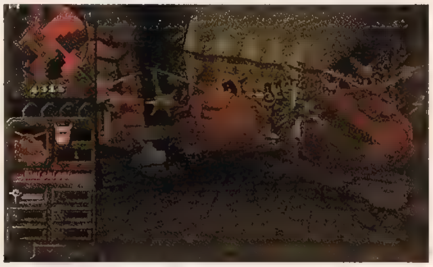


Forget dragon slaying and damsel saving. **Dungeon Keeper** *pumps pure evil into your veins... and you'll love it.*

Adding even more to this dark reality are superbly engineered sound effects, such as the "yipeees" of your imps when you let them go and the pitter-patter of their little feet as they run about. The ambient CD-audio soundtrack swims in a sea of minor chords suitable for spelunking.

What makes *Dungeon Keeper* such a thrill is the simple point-and-click interface, and the sheer depth and innovative mixture of gameplay. *Dungeon Keeper* is part land-development sim. Carve out your ziggurat and zone how your domain develops. Only through careful design will you attract armies. Screw up, and your forces get testy. Eventually, inter-species fighting and vandalism break out as your minion's advanced AI reacts to your actions. Forces must be well fed. Don't let your gold reserves diminish, but also remember to pour wealth into researching new spells, such as the devastating lightning strike.

Once you meet the enemy, whether they be wandering adventurers looking for loot or rival Dungeon Keepers' hordes, the game seamlessly shifts to a real-time war game where hordes fight to the death against the invaders.



Possess your minion's mind and take a stroll down the dark corridors of your dungeon.

Multiplayer is handled head-to-head via modem or serial connection, while IPX handles up to four Dungeon Keepers in a free-for-all battle to see who's the man with the master plan. Too bad Bullfrog neglected TCP/IP support.

Despite some pixelated shortcomings, *Dungeon Keeper* lures you six feet under with an original premise and keeps you there with a lethal combination of moody graphics and awesome, in-depth gameplay. This is what gaming is all about.

— *Andrew Sanchez*

boot verdict 9

Price $50
Developer Bullfrog
Publisher Electronic Arts
Phone 800.425.4525
URL www.bullfrog.co.uk

Cambridge **SoundWorks**

SoundWorks packin' a whole lotta sound

boot KICK ASS! PRODUCT

The SoundWorks fills your room with sonic ecstasy.

SoundWorks proves you don't need any fancy pants surround-sound processors to get awesome sound.

The SoundWorks is a three-piece subwoofer/satellite system armed with a pair of Cambridge SoundWorks' tiny $2^{3}/_{4}$-inch speakers, which are enclosed in sealed 3.5-inch cubes and handle frequencies from 150Hz up.

The woofer is in a single-reflex bandpass enclosure. The box's rounded vent lip stifles extemporaneous air noise, while the low-pass crossover and natural filtering tendencies of a bandpass box kill unwanted high frequencies. The subwoofer volume control and speaker leads are located on the $5^{5}/_{8}$ x 8 x 9 $^{5}/_{8}$-inch subwoofer enclosure, which has the twin amplifiers for the sub and the satellites. The internal 120VAC transformer eliminates the need for a hefty power brick.

A variable potentiometer in line with the $^{1}/_{8}$-inch miniplug acts as master volume control—a kludge, but effective nevertheless. Angled, free-standing brackets for the satellites and speaker wire complete the package.

Loading the bandpass box in a corner and firing up the SoundWorks fills the room with aural ecstasy. Thanks to bi-amplification, your satellites won't snap, crackle, or pop when you crank up the beats. Don't let those tiny satellites fool you. A sweet combination of active equalization and precise engineering deliver surprisingly solid lower mid-bass from the $2^{3}/_{4}$-inch drivers and exceptional sonic performance across their frequency spectrum. Female vocals and cymbal crashes are exquisitely clear, and the granite-solid center stage and wide, immersive soundstage complete the package.

Whether it's *Quake*'s grenade explosions and Gothic soundtrack, or jazzy upright bass plucks, low-frequency response is taut, controlled, and fills the room with rich, low frequencies, with maximum bass energies heating up frequencies above 70Hz, and lower bass rolling off below 40Hz—so don't expect any earthquake simulations. (But, natural room acoustics go far toward reinforcing bass tones.)

It may not tear the house down like its boomier MicroWorks brother, but Cambridge packs a whole lotta sound in SoundWorks' tiny package.

— *Andrew Sanchez*

Price $220
Company Cambridge SoundWorks
Phone 800.367.4434
URL www.hifi.com

boot verdict 9

Extreme **Assault**

Combat taken to the extreme

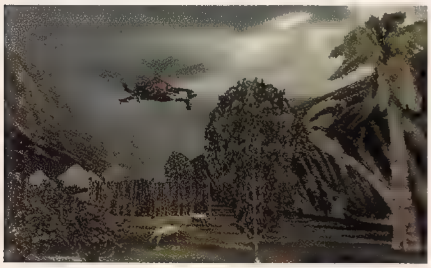
TRY IT ON THE DISC

CHECKLIST

Maximum Resolution/Color
640x480/16-bit
MS-DOS Native
Multiplayer
LAN Kali

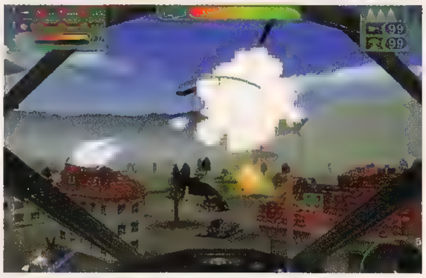
Extreme Assault attacks your senses with white-knuckled gameplay, eye-popping graphics, and hair-raising action. Don't look for combat-sim realism here—this game has its own full-throttle arcade intensity.

You start out in the cockpit of a high-tech assault helicopter. The flight model is strictly arcade: You can travel around in horizontal and vertical dimensions, but there's a fixed ceiling, and you can't crash into the floor. The 57 missions really use 3D space to their advantage. You may have to fly down a valley while strafing trucks or dodge between buildings to take out ground installations. Later, you drive a hover tank down tunnels, through futuristic factories. Enemy AI will have hostile choppers and tanks shrewdly dodging your fire and circling around behind you. You have to change altitude and direction constantly to avoid being toast.



Extreme Assault *pulls smooth terrain and fog effects without hardware acceleration.*

The texture-mapped polygon terrain includes valleys, mountains, rivers, and a profusion of incidental objects, including intricate buildings. Display options range from 320x200 in 8-bit color up to 640x480 at 16-bit color—the latter running effortlessly on a P166, with MMX-based systems enjoying better transparency effects. Real-time lighting, transparencies, perspective-correct texture mapping, and an impressive fogging effect are all beautifully rendered without the aid of 3D acceleration. 3Dfx accelerator support is promised as a patch, as is support for force-feedback joysticks.



In later missions you command a hover tank.

The game's only real problem is its awkward default controls, which place related functions at the four corners of the keyboard. You can reconfigure, but it's tricky to get a workable setup.

Still, *Extreme Assault* is one extremely entertaining assault on the senses.

— *Frank Lenk*

Price $50
Developer/Publisher Blue Byte
Phone 800.933.2983
URL www.bluebyte.com

boot verdict 8

Illustrator 7.0

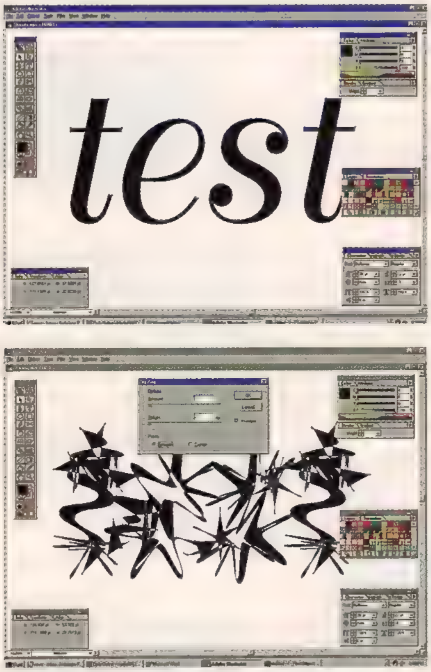
All in the Adobe family

First *PageMaker* received a *Photoshop*-inspired interfacelift (see review page 92), and now the original vector-based illustration program of the DTP revolution has checked in to the same spa and walked out with the same look. And, like *PageMaker 6.5*, the new *Illustrator 7.0* also received an infusion of web-related abilities to help it survive publishing's transition from paper to pixels.

All in all, the plastic surgeons at Adobe have done a tremendous job with *Illustrator's* traditionally Spartan interface. By eschewing the make-it-a-palette-and-they-will-come theory popularized by Fractal Design's graphics apps and weaving in an appropriate set of tools and tabbed palettes that will be familiar to anyone who uses the program's sister apps, Adobe has made a good thing better. Shared shortcuts make jumping between these programs exceptionally intuitive.

Illustrator's new palettes can also be connected ("docked" is Adobe's term) and moved as a unit to spare the hassle of pushing a flock of floaters around just to look at the work in progress.

The tools contained in the new interface are as good as the boxes they come in. The new Transform palette is reminiscent of the bar at the bottom of *QuarkXpress* documents (and now *PageMaker's)* that allows you to numerically set object coordinates, dimensions, and angle of rotation. *Illustrator's* version goes a step further providing skewing abilities for vector and raster images that are slicker than those found in *Photoshop*. The Layers palette in *Illustrator* is a particularly welcome addition that operates nearly exactly the same as its *Photoshop* role model, sans relational mixing of images.

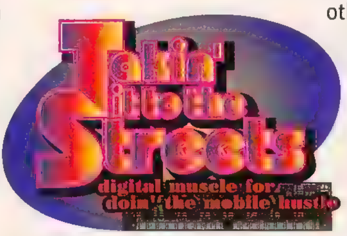


Plain text can be converted to editable outlines in Illustrator 7.0 (above) and then any of the stylize or distort filters can be laid on it (below) for instant expressionist artwork worthy of any upscale art gallery.

To get all your ducks in a row, *Illustrator* has added snap-to grids and a special Align palette with six options for alignment and distribution of on-screen objects. Very handy. Unfortunately, you still can't snap-to the custom guides the program can create.

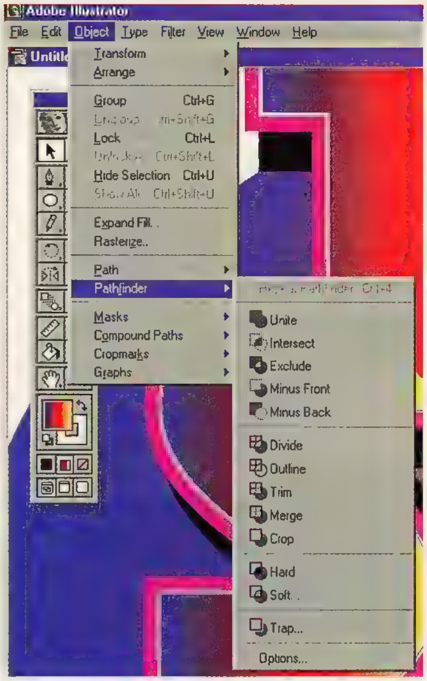
The plethora of Pathfinder operations built into *Illustrator* make many of the previously daunting tasks a snap. And a new Reshape tool lets you forego the enigmatic control points and bars and simply push lines about. While this sacrifices much of the control *Illustrator* is famous for, it opens the door for neophytes hacking a logo or creative types who want to randomly explore an image.

The boundaries between *Illustrator's* vector world of Postscript printers and the raster-based online world are falling fast—as evidenced by version 7.0's ability to import any *Photoshop*-compatible format. Add the new Rasterize command for converting objects within *Illustrator* and the program's support for *Photoshop*-compatible plug-ins and it becomes much harder to pigeonhole this program. *Illustrator's* excellent new caching techniques make working with behemoth linked files a breeze, especially compared to the herky-jerky implementation in previous versions.


Takin' it to the Streets
digital muscle for doin' the mobile hustle

The final artwork would do the Doobies proud.

Along with drag-and-drop between *Photoshop* and *PageMaker*, the new *Illustrator* also lets you create designs with embedded URLs that can then be dragged and dropped into Adobe's HTML editor *PageMill* for client- or server-side image maps. For even more ambitious online efforts, the program can export GIF89a format complete with user-definable transparency, interlacing, and color palette (including the 216 "safe" colors recommended for the web).



Illustrator 7.0*'s menu full of Pathfinder operations makes previously arduous tasks a snap.*

Old-school types still designing for paper will dig the new object-oriented trapping controls, global CMYK conversions, halftone line-count settings, and the inclusion of the *Separator* utility under the *Illustrator* umbrella. Hopefully other Adobe utilities such as *Streamline* (for tracing bitmaps into paths) and *Dimensions* (for creating 3D text and objects) will follow suit.

Nonetheless, *Illustrator's* refined quality overshadows *CorelDraw's* mixed bag of bells and whistles; and its sleek interface and family ties to *Photoshop* give it the nod over *FreeHand*. Whether you're designing for online or print, *Illustrator* is the best pro-caliber tool for the job.

— *Brad Dosland*

Price $595 ($249 for FreeHand or CorelDraw owners; $99 for PageMaker or Photoshop owners)
Developer/Publisher Adobe
Phone 800.649.3875
URL www.adobe.com

boot verdict 9

Plextor **12/20PleX** CD-ROM Drive

Sheer speed and control in the turns

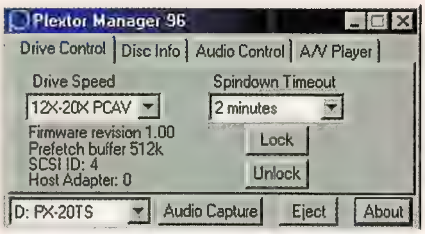
boot KICK ASS! PRODUCT

The Plextor 12/20PleX is the Ferrari F50 of CD-ROM drives. Sporting a high-performance SCSI P-CAV (Partial-Constant Angular Velocity) engine, it guarantees speed performance between 12x and 20x. This may sound like a hack, but keep in mind that most high-end 12x to 20x CAV drives don't really put out at that level. CAV drives, unlike CLV drives, spin the disc at a constant speed, so the data rate increases as the pickup moves to the outer edge of the disc; data is read more slowly from the inside tracks. And because most discs aren't full, you rarely realize a drive's full potential. Most CD-ROM drive manufacturers fail to mention this, pretending that their drives constantly retrieve data at the maximum rate. Plextor acknowledges this reality and builds drives with it in mind.

***The** disc control buttons on the front of the 12/20PleX make tunes handier, and the volume can be adjusted through either the dial or **Plextor Manager** software.*

Blessed with a 512K buffer and boasting an average random access rate of 88ms, the 12/20PleX revs up some serious throughput. True to its name, the 12/20PleX delivered 12x speeds (1845K/sec average transfer rates) in our testing, with the center and outside reads coming in at a solid 3050K/sec (20x speed). CPU utilization was typical of the best SCSI drives: 1 to 7 percent at speeds of 2x and 12x, respectively.

In addition to raw speed, the 12/20PleX is a versatile multiread drive that also reads CD-R/W (Re-Writable CD-ROM) discs. It also read a CD-UDF (Universal Disc Format) test disc gracefully, and promises variable packet writing compatibility.



Drive Speed: 12X-20X PCAV
Spindown Timeout: 2 minutes
Firmware revision 1.00
Prefetch buffer 512k
SCSI ID: 4
Host Adapter: 0
D: PX-20TS

Plextor Manager *reports disc format, file type, tracks, and sessions. It includes DiscDupe, which, along with a PlexWriter CD-R drive, allows you to burn discs with "bit-by-bit" accuracy on the fly.*

Finally, hooking up the 12/20PleX is a true Plug-and-Play affair—simply auto select the SCSI ID and set active termination—and it has the most thorough manual we've seen for a CD-ROM drive.

— *Sean Cleveland*

Price $269
Company Plextor
Phone 800.753.9867
URL www.plextor.com

boot verdict 9

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Brisbane, CA 94005

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boot	—	—	www.bootnet.com	Microsoft	23	—	www.microsoft.com
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Micro X	127	242	www.microx.com				

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150 North Hill Drive
Brisbane, CA 94005

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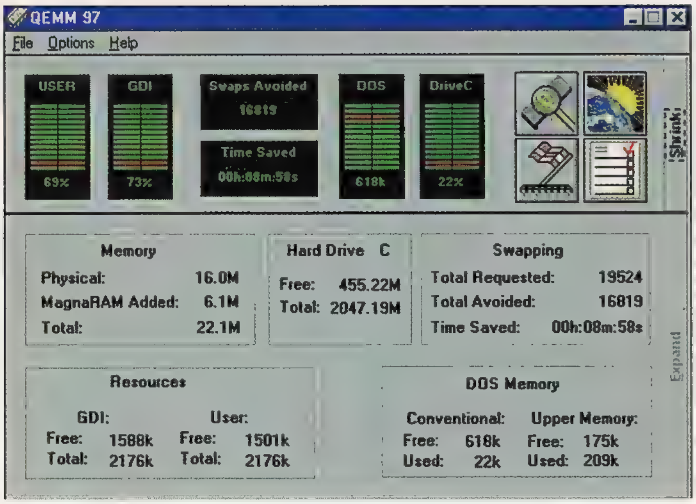
boot

QEMM 97

Squeezing the memory monkey

Quarterdeck took their tried and true, made them OSR/2 compatible, and slammed them in a new GUI: the *QEMM* Control Panel. Displaying memory gained, resources freed, swaps avoided, and the time saved are but a few of its features. There's also Manifest. A system tool displaying every detail of your machine, from memory addresses to BIOS versions. Welcome to Win95 memory management à la *QEMM 97*.

Quarterdeck's Optimize utility harkens back to the days of DOS 5.0 and Windows 3.x. If you lived in that world, or still do (ouch), you know how important memory management is, and *QEMM 97* is compatible with those historic OSes. Optimize still has its core apps. DOS-Up frees conventional memory by loading DOS selections into upper memory. StealthROM hides ROMs so their memory addresses can be used to load TSRs and device drivers, and, while finicky with some hardware, it gracefully recovers, freeing up an additional 90K conventional memory on our test machines. Also included is Stealth D*Space that maps the DoubleSpace or DOS 6.22 DriveSpace driver into the EMS page frame whenever it's needed.



Swaps Avoided 16819
Time Saved 00h:08m:58s

Memory
Physical: 16.0M
MagnaRAM Added: 6.1M
Total: 22.1M

Hard Drive C
Free: 455.22M
Total: 2047.19M

Swapping
Total Requested: 19524
Total Avoided: 16819
Time Saved: 00h:08m:58s

Resources
GDI:
Free: 1588k
Total: 2176k
User:
Free: 1501k
Total: 2176k

DOS Memory
Conventional:
Free: 618k
Used: 22k
Upper Memory:
Free: 175k
Used: 209k

Don't expect* QEMM 97 *to turn your machine into a speed demon. These utilities only really come into play when you have a large number of apps running.

MagnaRAM provides performance by compressing data in memory before it can be swapped out to the hard disk. Its buffer is dynamically resized depending on the amount of memory used: The more apps running, the higher the squeeze. The *QEMM* Control Panel shows you the memory gained and adds this to the total size. This is how *QEMM* gives you more memory than you physically have. During our heavy-load test, memory was increased from 32MB to 49MB. This memory is faster to read than if it were swapped out to virtual memory on the hard disk. In fact, swapping was reduced by 85 percent in our tests!

Program load speed increases weren't as significant as advertised—only giving a second or two faster results—and the DOS PIF Optimizer didn't increase the speed of DOS apps (our *Quake* benchmark actually took a frame rate hit).

Another cool feature is Update-It, which searches Quarterdeck's web site for official *QEMM* revisions and installs them automatically. Installation is intuitive and running Optimize informs you of problems and offers numerous alternatives. The manual also contains a choose-your-own adventure-type troubleshooting section.

The Quickboot utility is the icing on the cake though, with warm boot only taking you to where Win95 boots and not where your machine searches for peripherals. It's the little things...

— Sean Cleveland

Running a Wide Load

The heavy load test we ran included the following programs running concurrently: Microsoft Word 97, Excel 97, Photoshop 4.0, Premiere 4.2, FileMaker Pro 3.0, Internet Explorer, Windows Explorer, Sound Forge 4.0, Designer 4.1, Detailer 1.0.2, LightWave 3D 5.5, Visual Café Pro 1.0, and Navigator Gold 3.0.

Price *$69 ($30 upgrade)*
Developer/Publisher *Quarterdeck*
Phone *800.683.6696*
URL *www.quarterdeck.com*

boot verdict 8

UnInstaller 4.5

Overbleached

Stoked about the new version of *UnInstaller?* Wondering what powerful new features and functionality have been added? Well, readjust your adrenaline level. Version 4.5 is no different from 4.0, except for a facelift, tummy tuck, and some liposuction.

The fact is that CyberMedia, famous for *First Aid 97* and *Oil Change*, acquired the *UnInstaller* product and simply slapped in some of their own technology, repackaged it with a great laundry-detergent box design, and released it as *UnInstaller 4.5*. Even the manual is the same as version 4.0's—with the addition of a four-page addendum. Version 4.5 does contain one new feature—CyberMedia's *Oil Change* automatic-update technology—and one handy enhancement. Using the Update button built into the new interface, *UnInstaller* updates itself automatically—updating the expanded database of applications as they are released. The enhancement provides a 50-percent speed increase of system scans, which used to take up to five minutes before you could actually use the application.

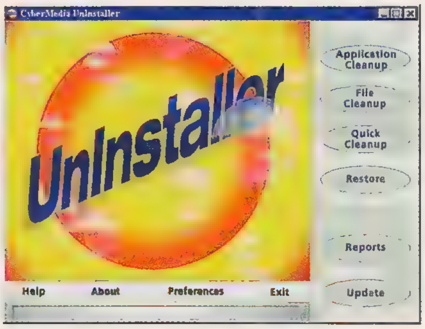
Registered users receive unlimited, free technical support from CyberMedia.

Other than the new interface, that's pretty much all that's changed. For more info, read the *UnInstaller 4.0* review in *boot* 06 or on the *bootNet* web site.

— Sean Cleveland

Price *$40*
Developer/Publisher *CyberMedia*
Phone *800.922.3383*
URL *www.cybermedia.com*

boot verdict 7

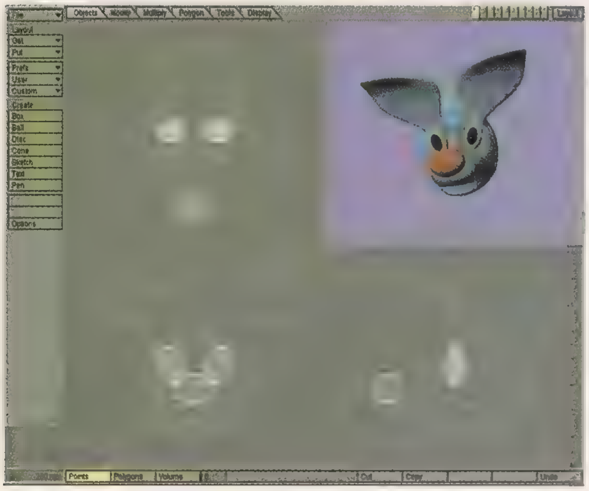


UnInstaller 4.5*'s screen shows off its only new technology: the Update button for the* Oil Change *automatic update.*

LightWave 3D 5.5

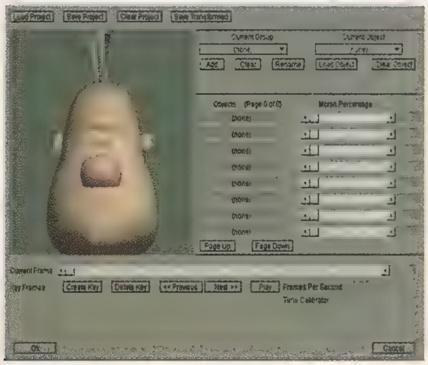
Catch the wave

The new version of *LightWave 3D* adds so many features you'd think it was much more than an incremental upgrade to this popular modeling and animation program. New to the streamlined interface are real-time texture mapping, non-modal environments, and user-definable interface colors and configurations.



LightWave 3D 5.5's *Modeler interface has been completely overhauled and now offers more opportunity for customization.*

Some of the previous version's modeling tools have new options. The Flex tools now use the right mouse button to set the range of influence. These tools let you set an envelope for Falloff when you bring up each tool's numeric requester—use predefined envelopes or adjust the sliders for exact control. This adds a lot of power and you'll wonder how you ever lived without them.



The Morph Gizmo interface. You can make the eyes blink just by assigning them to a slider.

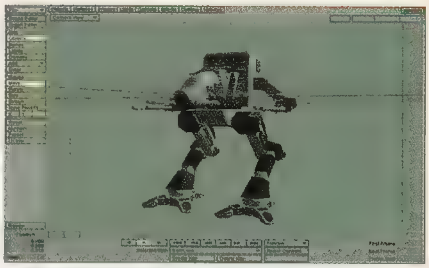
The programmers went nuts adding new Layout features. Now available in Layout are modeling tools that can be animated, a cell shader, bone options, and a particle system (actually a "light" version of the third-party Particle Storm plug-in). The redesigned Layout interface sports some cool changes. There are animation controls at the bottom of the Layout view so you can watch an animation preview any time with the click of a button. You can add key frames during an animation by changing the object's position as the animation preview plays. And while *LightWave* supports OpenGL for previews, version 5.5 also shows textures in OpenGL mode for even better feedback—and yes, you can place textures interactively on objects.

The Modeler screen's interface has been completely redesigned. You can alter options such as the Preview window background color, define function key sets for different users, set loading and saving options, and tweak the interface to make *LightWave* easier to use.

New modeling functions include Dragnet, which combines Drag and Magnet functions into one powerful tool. Knife lets you slice across an object, making geometry additions fast and easy. The new multi-segment box primitive will appeal to MetaNURBS users, as will the Smooth Scale operation, which smoothly scales selected points, creating subtle changes.

Want to animate character faces? You'll love Morph Gizmo. This plug-in lets you morph various parts of a face. You can raise/lower eyebrows, move the mouth or make the eyes blink, then string these changes together and create a whole facial animation. Combining this feature with the ease of building characters in Modeler moves *LightWave 3D* to the front of the character-animation race.

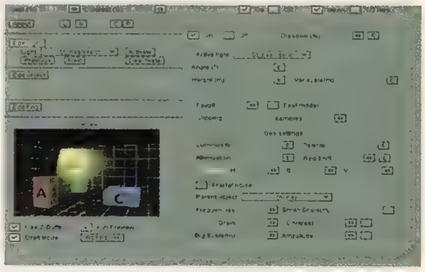
If you thought *LightWave*'s lens flare feature was fun, wait until you see the volumetric lighting plug-in, Streamer. It lets you create effects such as glows, realistic layered fog, and smoky light cones.



LightWave 3D 5.5's *redesigned Layout interface has a bunch of new features including animation controls so you can preview an animation with the click of a button.*

The plug-in's profusion of options make it easy to spend hours playing with all the different controls. Streamer is an amazing addition and is sure to become one of the most highly used portions of *LightWave*.

Underneath it all beats a newly optimized engine that takes advantage of multiple processors and OpenGL hardware to reduce rendering times. Inverse kinematics computations have benefited as well, with speed increases up to 500 percent. Direct3D support complements the already impressive OpenGL support, and MMX enhancements kick the engine into high gear.



The Streamer plug-in interface showing a preview of a volumetric spotlight scene.

There are easily enough changes in this program to call it version 6.0. Let's just say that this upgrade makes *LightWave 3D* an indispensable tool if you're into 3D graphics and animation.

— *Dave Thomas*

Price $2,500
Developer/Publisher
NewTek
Phone 913.228.8000
URL www.newtek.com

boot verdict 9

TechWorks Ultimate **3D**

A waste of good RAM

The first two graphics cards based on Cirrus Logic's Laguna 3D chip (from Creative Labs and VideoLogic) were amazing. These were 4MB 3D cards for less than $100. Even more amazing is how bad these cards were. TechWorks' Ultimate 3D is another dirt-cheap Laguna-based board, this time sporting up to 8MB. Those other cards didn't fall short due to lack of RAM, and even with twice the memory, the Ultimate 3D is just as flat.

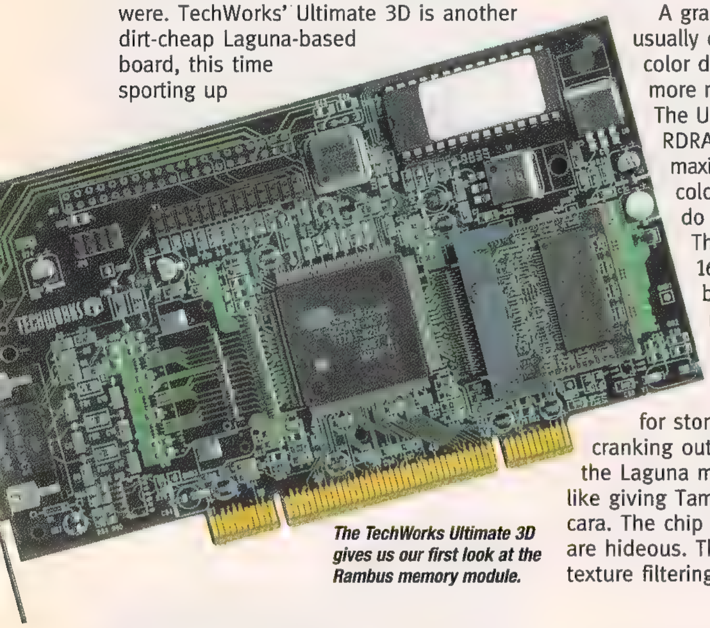
A graphics card usually offers higher resolutions and color depths when equipped with more memory. Not in this case. The Ultimate 3D's 8MB of Rambus RDRAM memory only musters a maximum 1280x1024 with 16-bit color, while many 4MB boards do true color at that resolution. The Ultimate 3D promises 1600x1200 at 256 colors, but current drivers don't recognize those resolutions.

Even without higher resolutions, extra memory should at least be good for storing more textures when cranking out 3D, right? Wrong. Giving the Laguna more memory for textures is like giving Tammy Faye Bakker more mascara. The chip may use it, but the results are hideous. The Laguna doesn't do true texture filtering, and its perspective correction is totally broken. 3D textures look warped and chunky, and the screen is constantly filled with annoying artifacts.

The Ultimate 3D's DOS performance will make your Pentium feel like a 486, as do the DirectDraw speeds under Windows. The straight-up 2D speed is fast enough, and the video acceleration is good; but after all the other marks against the Ultimate 3D, who cares?

Ignore the bargain price and run away from this beast as fast as you can.

— Chris Dunphy



The TechWorks Ultimate 3D gives us our first look at the Rambus memory module.

Tech Specs

Maximum 24-bit Resolution/Refresh	1024x768/85Hz
Maximum 16-bit Resolution/Refresh	1280x1024/85Hz
VESA 2.0 Support	Yes
MDK Perf-Test	78
WinMark 97 10x7x16	55.3 / 20.4
Quake 640x480	7.8fps
Quake 800x600	5.0fps
TerraMarks (Level 1/2/3)	224 / 223 / failed

Price *$179 (8MB); $99 (4MB)*
Company *TechWorks*
Phone *800.688.7466*
URL *www.techworks.com*

boot verdict 1

Star Trek: Generations

Better never than late

MicroProse's *Star Trek Generations* is one mixed-up first-person action, adventure, and space-combat game. Clinging to the movie as closely as Counselor Troi's spandex jumpsuit hugs her Betazoid curves, the haphazard plot follows Soran, a crazed scientist played by Malcom McDowell, in his quest to find a mythical paradise dimension known as "The Nexus." You, along with the crew of the Enterprise, get to stop him.

Deep within the 2½D ray-cast bowels of a Klingon rebel outpost, you're greeted by all manner of stiffly animated sprite foes in the cramped half-screen viewport. Whip out your phaser but don't expect colored light sourcing or flying chunks of flesh when you blast something—set to maximum, all you'll see is four frames of disintegration animation.

CHECKLIST

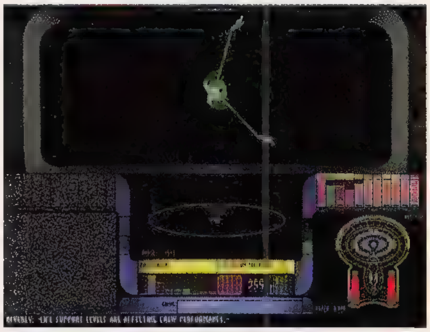
Maximum Resolution/Color
640x480/16-bit
DirectX
DirectDraw DirectSound
MMX Enhanced

The wannabe space-combat simulator portion of the game has you launching photon torpedoes and phaser fire at texture-mapped polygon cruisers that lack collision detection and pass right through your starship. Without helm commands, combat is a joke.

Even as an adventure game, *ST:G* runs out of energy. What at first seems like a vast sector of space to freely explore, rapidly becomes a linear quest. You're always one step behind Soran. Fail too many missions and the game unceremoniously notifies you that another starship is relieving you, then dumps you to the main menu. The Save Game feature is also a letdown. Even if you're almost at the end of a mission, saving the game and reloading it plops you at the beginning of that mission.

Not even the digitized voices of your favorite *ST:NG* characters, a bunch of cool FMV cut scenes, or MMX support can save *Star Trek: Generations* from going down with its mediocre gaming engine.

— Andrew Sanchez



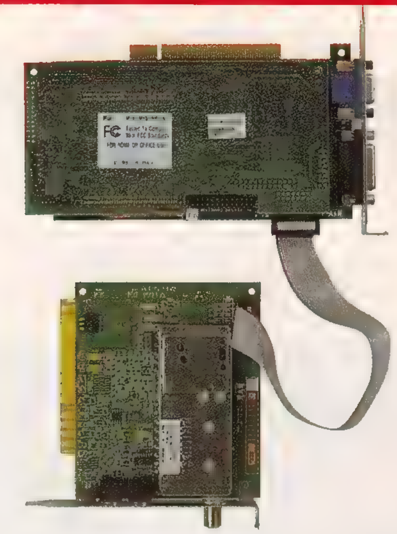
Here comes a Klingon Bird-of-Prey! Don't worry, they pass right through you!

Price *$49*
Developer/Publisher *MicroProse*
Phone *800.695.4263*
URL *www.microprose.com*

boot verdict 2

Matrox **Mystique 220** and **Rainbow** Runner

Partial credit



The Rainbow Runner fits snuggly on top of the Mystique 220, while the TV tuner add-on sits in an ISA slot and connects to the rest via a ribbon cable.

The Matrox Mystique was among the first 3D accelerators *boot* looked at (way back in *boot* 02). We were impressed by its 2D speed, but totally unimpressed by its 3D. The Mystique 220 is a new take that supports more memory, a faster RAMDAC, and fogging, but it's still nothing to get excited about. Snapping on a Rainbow Runner media module spices things up a bit, but not enough to justify the cost—unless you're really into video. The latest offerings from Matrox may not be total mistakes, but at best they only earn partial credit.

Tech Specs

Max 24-bit Resolution/Refresh	1280x1024/85Hz
Max 16-bit Resolution/Refresh	1920x1080/60Hz
VESA 2.0 Support	Yes
Virtual Desktop Support	Yes
MDK Perf-Test	96
Ziff-Davis 3D Winbench	51.6
WinMark 97 10x7x16	84.8 / 40
WinMark 97 12x10x24	54.1 / 28.4
WinMark 97 16x12x16	65.2 / 34.9
Quake 640x480	15.9fps
Quake 800x600	10.4fps
TerraMarks (Level 1/2/3)	247 / 247 / failed

Ziff-Davis Business Graphics WinMarks/High-End Graphics WinMarks

The Mystique 220 is a speedy 3D accelerator, in the same sense that a Pentium II is. With no support for filtering or alpha blending, 3D games on the Mystique don't look much better than if they were running in software on a fast processor. The Mystique makes a difference, but much less than a 3D accelerator should. At least the Mystique 220 adds the missing essential of fog, though since the fog is implemplented with a screen-door stippling effect rather than a true alpha blend, the effect is less than impressive.

The 220MHz RAMDAC coupled with 4MB of SGRAM excels at 2D work, cranking out 16-bit color at 1600x1200 and above. If you need more power, expand to 8MB and do 24-bit color in 1600x1200. The video acceleration in a window isn't nearly as boundless—though the scaled-video quality is excellent, acceleration fails at higher resolutions and color depths.

The Rainbow Runner snaps onto any Mystique (old or new) or Millennium II, but you must sacrifice your memory daughterboard. This may be too high a price to pay for 2MB Mystique owners who can't bear to part with their upgrades to 4MB. Once installed, the Rainbow Runner provides video-in and -out (both composite and S-video), hardware MPEG playback, and real-time MJPEG compression of captured video. A TV-tuner card can be added in a free ISA slot.

When watching TV via the Rainbow Runner, the full-screen video window can be output to the video-out jacks. This great feature is offset by the inability to scale the TV window to full screen on your monitor. In fact, the Mystique's video scaler leaves a lot to be desired—it doesn't allow full-screen windows in many resolutions. Still, scaled video quality is better than average.

The TV-tuner software is complete and easy to use, allowing recording of closed-caption transcripts or the entire video of a show based on triggered hot words or timed events. Thanks to the MJPEG hardware, the quality of captured video is unrivaled for this price. If you have the hard-drive space for it (depending on quality settings, you'll need between 2MB and 200MB a minute), your PC can replace your VCR.

The Rainbow Runner can turn your computer into a VCR, if you have the hard drive space to spare.

If you want to replace your monitor with a TV, the Rainbow Runner is frustratingly limited. DOS text screens are not supported, and only games running at 640x400 or 640x480 are sent to the big screen. Popular resolutions such as 512x384 and 320x200 are not supported, and Windows only offers 640x480 or 720x480 for your desktop. At least the TV-out is clean and flicker-free.

The Rainbow Runner is one of the best roads to high-quality video without busting the bank, though its biggest problem is living with the Mystique. For a fraction of the price of the Mystique, Rainbow Runner, and the tuner add-on, you can buy ATI's All-In-Wonder and save a slot. It may not excel at some of the Rainbow Runner's specialties, but it will never let you down.

— *Chris Dunphy*

boot verdict 6

Price *Mystique 220*
$179 (4MB)
Company *Matrox*
Phone *800.844.8302*
URL *www.matrox.com*
Bundle *Kai's PowerGoo, Disney's Toy Story, SoftPEG 2.2, WIRL, Moto Racer or business bundle: Simply 3D 2, Picture Publisher 7, Netscape Navigator 3.0, SoftPEG 2.2, WIRL, Page Plus 4, and PointCast Client*

boot verdict 7

Price *Rainbow Runner $249*
Rainbow Runner TV $79
Bundle *Photo Express, VDOPhone Internet Phone, MediaStudio, PowerRemote*

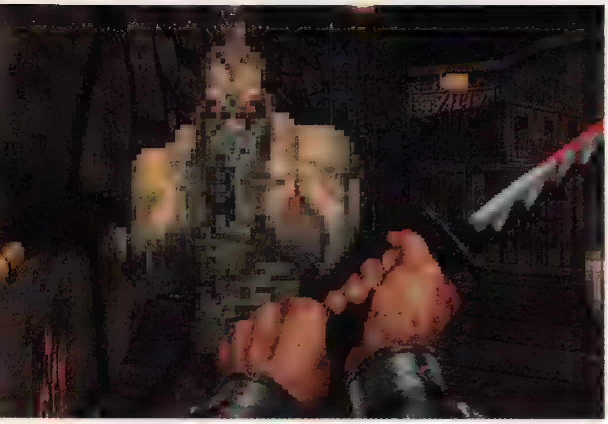
Motion-JPEG?

Motion-JPEG (MJPEG) applies the JPEG compression algorithm that has become so common on the Internet 30 times a second, allowing for high-quality video recording and playback. Because each frame is compressed independently, MJPEG does not offer the same amazing amount of compression that MPEG achieves. But this independence makes MJPEG a perfect match for video editing. MPEG is a preferable format for playback, so once your masterpiece is completed a software MPEG converter can churn away on the data for a few hours to ready your work for distribution. Thoughtfully, Matrox includes just such a converter with the Rainbow Runner.

Shadow Warrior

A blood-filled farewell

Shadow Warrior is the aging BUILD engine's last party, with weapons ranging from a bloodied blade and razor-sharp shurikins to quad-barreled shotguns and multi-mode missile launchers. 3D Realms has optimized the 2½D raycast BUILD engine we've grown to love about as good as it's gonna get, with a combination of semitransparent water and volume pixels for perfect rotating objects. Too bad the enemies are still 45-degree, pre-rendered sprites, and pixelated as hell (not to mention badly animated).



Shadow Warrior*'s crazy-ass weapons will have the flesh flying and demons droppin'.*

TRY IT ON THE DISC

All the cool tricks from previous BUILD blood baths, including sector stacking and texture-mapped polygons, are present. The textures look great from afar, but are blocky up close. The ladders in *Redneck Rampage* are here, plus the ability to jump into massive vehicles of destruction and drive them around firing their weaponry. This makes for great multiplayer "WangBangs."

Maxing out at 800x600, cheat codes can crank resolutions as high as 1280x1024, although frame rates drop to slide-show status. 640x480 gets you a slick 24fps on most systems, and 800x600 should put you in the high teens.

Never shying away from debauchery, *Shadow Warrior* is filled with bad sex jokes and hentai chicks. While the Asian flava is a welcome respite, you'll tire of the bad dialogue.

Gameplay maintains the interactivity level set by *Duke Nukem 3D*, with working pachinko machines, remote-control toy cars, destructible objects, and furry bunnies awaiting your poking and prodding.

Shadow Warrior may not be the cleanest BUILD-based game, but it packs an array of multi-mode weaponry and new tricks making it a fitting end to the BUILD dynasty.

— *Andrew Sanchez*

CHECKLIST

Maximum Resolution/Color
1280x1024/8-bit
MS-DOS Native
Multiplayer
Serial IPX TCP/IP Ten

Price $40
Developer 3D Realms
Publisher GT Interactive
Phone 800.305.3390
URL www.3drealms.com

boot verdict 7

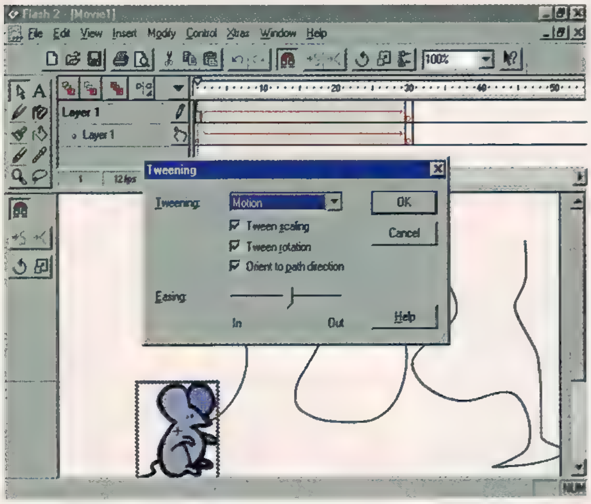
Flash 2.0

Flash your site

TRY IT ON THE DISC

Flash 2.0, a cousin of Macromedia *Director*, brings a download-friendly approach to generating streaming, vector-based animations for the web. It's amazing what *Flash 2.0* fits in a mere 30K! Browsers with the Shockwave *Flash* plug-in can view lightly interactive multimedia without the bandwidth hit of *Director*-developed Shockwave apps.

While *Flash 2.0* has the standard draw, paint, and fill tools and the ability to import/export a variety of graphics formats including GIF, Adobe *Illustrator*, and bitmaps, its strength lies in creating "mini-movies." The movies are not as interactive as the content created by *Director*, but they support a certain amount of interactivity—a mouse click can trigger a sound, a change of picture, or bring up a URL. Actions can be as simple as a button that changes color when clicked, or complicated menu screens with several layers of animation and synchronized WAV and AIFF files. The created movies and the *Flash* player required to view them are both much smaller than the files generated by *Director*, making it a better choice for developing multimedia that doesn't need a lot of interactivity.

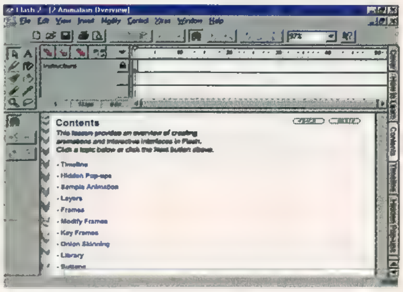


Tweening

Tweening: Motion
☑ Tween scaling
☑ Tween rotation
☑ Orient to path direction
Easing: In Out

Simple motion animation with **Flash 2.0** *is a snap using "Tweening."*

Also included is an extensive library of *Flash*-ready elements such as buttons, sounds, and still or animated clip art. There's even sample HTML code to help integrate *Flash* content in your site if you're not comfortable with HTML code.



Flash 2 - [2 Animation Overview]
File Edit View Insert Modify Control Xtras Window Help
97%
Instructions

Contents

This lesson provides an overview of creating animations and interactive interfaces in Flash. Click a topic below or click the Next button above.

- Timeline
- Hidden Pop-ups
- Sample Animation
- Layers
- Frames
- Modify Frames
- Key Frames
- Onion Skinning
- Library
- Buttons

Flash 2.0 *flattens the learning curve with several good step-by-step primers.*

If all you need are simple animated GIFs, *Flash 2.0* is not the program for you. And those who crave large-scale, fully interactive presentations should sink their teeth into *Director*. But if you're looking for snazzy banners, navigation buttons, menus, and animated graphic elements, whipping them up with *Flash 2.0* is a snap.

— *Tara Calishain*

Price $200
Developer/Publisher
Macromedia
Phone 800.326.2128
URL www.macromedia.com

boot verdict 8

Samplitude Studio 4.0

TRY IT ON THE DISC

Studio in a box

boot KICK ASS! PRODUCT

Samplitude's direct-to-disc recording has gone from great to greater in just a few years. SEK'D pushes the envelope again with its latest: *Studio 4.03*. Unlimited audio tracks per Virtual Project (VIP) and awesome effects put this product ahead of the rest.

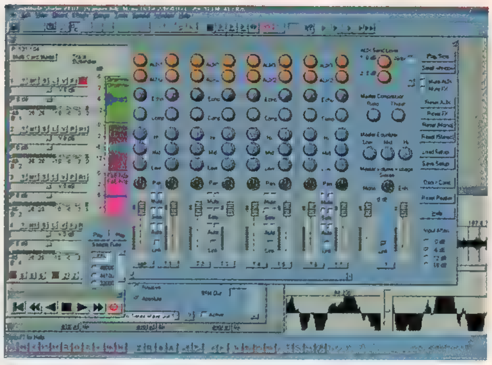
Because objects are only a "window" of the actual sound file, operations are instantaneous and incredibly simple. Objects can be configured either individually or grouped by name, color, volume, and locking. Automatic cross-fades are available by overlapping objects. "Sticky" objects will snap to boundaries such as other track's objects, measures/times, or markers—fantastic for perfectly syncing digital audio.

Each track has a full suite of controls, and a volume and panning curve can be drawn for the perfect mix. Mono tracks can also be linked to simulate stereo.

Waveforms can be edited to sample level, and a fabulous three-paned window makes finding loop points brainless. A slew of high-quality effects come standard: FFT filter/analyzer with freehand drawing tool, Noise Reduction, Time stretch/expand, De-Clipping, Distortion, Graphic EQ, three-band full Parametric EQ, Room Simulator, Compressor/Expander/Gate, Surround-Sound, and a Convolution tool, which processes one sound with another.

While most effects aren't real-time, they do have a preview button and the 8x4 mixer processes volume, panning, Hi/Mid/Low Parametric EQ, echo-decay settings, and compressor-ratio settings in real time. The flying faders may be grouped and two auxiliary sends can be used for external processing.

Multiple projects can be open simultaneously for remixing, and with 100 levels of undo, feel free to experiment with tracks and arrangements. Multiple audio cards are supported and can be assigned to each track individually. A Remove Unused Samples function keeps your hard drive at optimum size. AVI and MIDI files can be synced with frame accuracy. The video of the AVI is displayed along the top, and the audio portion can be replaced once it's just right. In conjunction with the *Point CD Audio* software, a CD-R can be burned directly complete with sub/index marks and table of contents.



Samplitude Studio 4.0*'s real-time mixer is a powerful new feature that closes the gap between software and hardware.*

The biggest gripe about the program is its nonstandard interface, such as scroll bars that lack arrows. Still, *Samplitude* is intuitive, fast, and powerful enough for any serious multitrack digital audio.

– Daevid Vincent

Price $600
Developer SEK'D
Publisher Hohner Midia
Phone 707.578.2023
URL www.sekd.com

boot verdict 9

Cakewalk **Pro Audio 6.0** Deluxe

TRY IT ON THE DISC

The best gets better

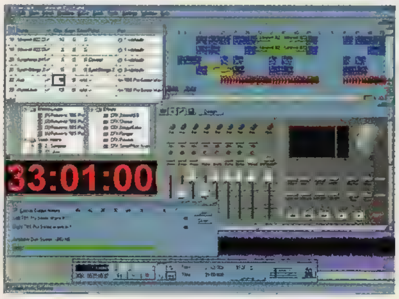
boot KICK ASS! PRODUCT

Power sequencers serious about music production can't go wrong with *Cakewalk Pro Audio*'s major upgrade, replete with the features you've been dying for and others you'll take for granted after using them just once.

The most prominent new features are the nondestructive CFX real-time effects and the StudioWare addition. Included are Delay, Chorus, Reverb, Flanger, Time Stretching/Compression and Expansion, Pitch Shifting (Format-preserving), and a 2-Band Parametric EQ. Parameters can be saved as custom presets and can be changed on the fly (although they can't be recorded).

Cakewalk has even adopted the DirectX standard so third parties such as *Waves*, *Tracer*, and *Qsound* can develop plug-ins.

StudioWare allows graphic manipulation of any MIDI-controllable gear by assigning SysEx messages to sliders, rotary pots, and buttons, giving much more control over tedious or even impossible operations via conventional front panels. Cakewalk promises to post a variety of "panels" on its web site, but there's no need to wait since it's so easy to create your own.



Cakewalk Pro Audio 6.0 Deluxe*'s StudioWare tames even the most intimidating MIDI gear.*

If you have the gear, multiple I/O is supported—select audio drivers as you would any other port. Always remember to use the card you recorded with for playback to prevent clock-drift differential. Clips can be copied as linked clips so changes are global through the chain.

Other features worth a shout-out include saving of screen layouts, improved printed output with percussion notation, record and playback of SysEx as events, N/RPN support, and the merging of the controllers view with the piano-roll view. Volume and pan are now -90dB to +18dB linear scaled, and a Take Vault protected directory prevents accidental deletion of audio takes.

Cakewalk hasn't handicapped its program to compensate for hardware limitations. Track counts and effects that match the speed of your PC are proof of forward thinking.

– Daevid Vincent

Price $530 deluxe;
($430 standard)
Developer/Publisher
Cakewalk Music Software
Phone 888.225.39255
URL www.cakewalk.com

boot verdict 9

Triple Play 98

A homer to dead center

With subtle nuances hidden in every aspect of graphics, gameplay, and ballpark atmosphere, *Triple Play 98* is a bold new world of simulated 3D baseball.

The ultrarealism begins with superbly rendered stadiums that recreate every precious detail of their original models, including fully functional second-deck scoreboards and variable crowd sizes. Even better, all objects respect scale. The players and the ball are properly dwarfed by their cavernous surroundings, and sprinting 90 feet in the outfield feels the same as crossing 90 feet in the infield. The overall feeling is one of... *majesty*.

With up to 800 polygons per batter, specific players are recognizable right down to their name, number, physique, and trademark batting stance. (EA Sports secured the licenses necessary for player names, stats, team logos, and stadiums.) Once you send a ball in play, seamless panning displays a variety of realistic fielding animations. On the diamond—where each middle infielder has 10 specific animations—a shortstop might dive for a liner, smother the ball with his chest, jump to his feet, and rocket the ball to first.

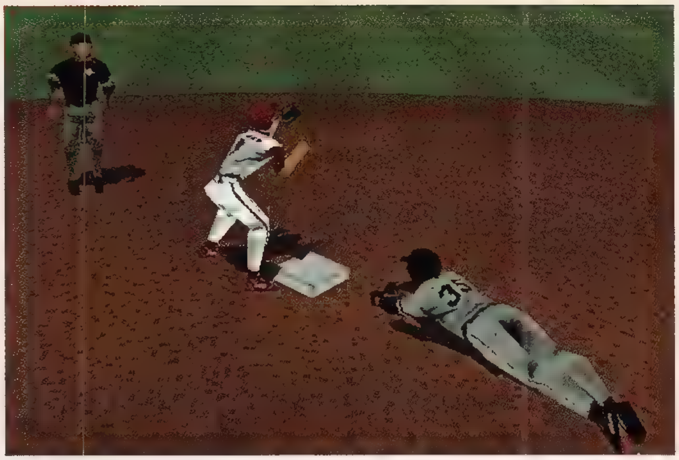
If you're playing on a good system (P200/killer 2D) with all rendering options turned on, you'll get smooth frame rates at 800x600; push the resolution any higher, and you'll remember you're just playing a computer game. On a P166 with decent 2D, we had to turn off all rendering options and drop to 640x400 to approach playability.

The Dolby Surround sound enhances ballpark atmosphere and actual gameplay. The crowd gets noisy during tense situations and there's a distinct crack when you get good wood on the ball. A color commentator and play-by-play announcer chime in with facts about the home team's history, musings about poor attendance, and, best of all, opinions about pitch selection and batter selectiveness—listen carefully to refine your own strategy.

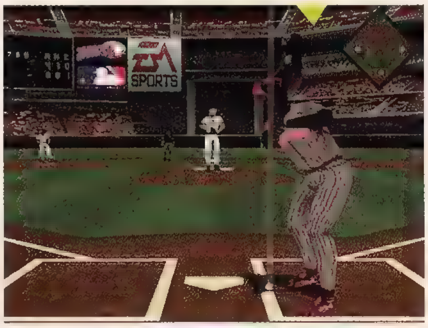
CHECKLIST

Maximum Resolution/Color
1280x1024/16-bit
Win95 Native
DirectX
DirectDraw DirectSound
Multiplayer
LAN Modem
Serial (up to four players using Gravis GrIP)

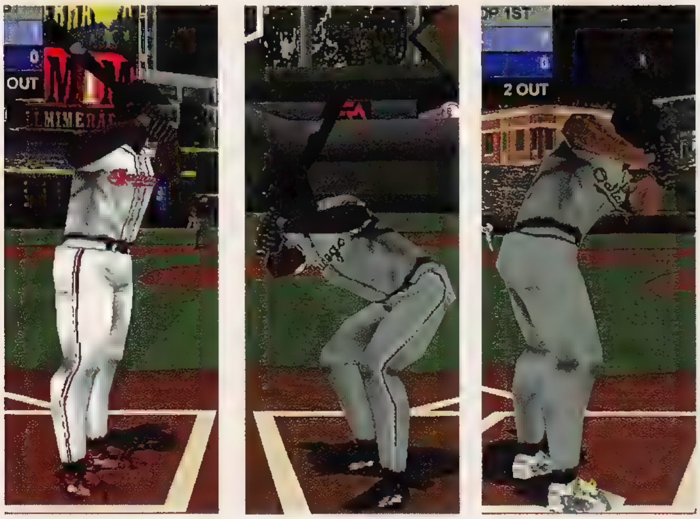
To really prepare for a game, read the extensive scouting reports describing a hitter's power, the percentage of balls he hits to each field, and the pitchers he's had the most success or trouble with. Overall, the game's statistical engine is flawless; any statistical category you might read on the back of a good baseball card can be retrieved at any time. By season's end, you'll get very realistic final numbers: *Triple Play 98* doesn't hand out homers to any journeyman hitter who takes broad cuts. Scores are realistic, and you'll lose your share of games if you're not patient enough for walks or smart enough on the base paths.



Overall, the infield animations are stupendous. Number 35 better hurry because throws in Triple Play 98 *perfectly replicate thier real-life speeds.*



For utmost realism, it's imperative that a stadium dwarf the players inside.



Dig the difference between Marquis Grissom's erect posture, Tony Phillips' crouch, and Jose Canseco's wide, open-toed stance.

Triple Play 98 is one of the finest baseball games ever developed, but it's not perfect. There's no visible "strike zone box" to pinpoint pitches, so you have to adjust in mid-air. Even more frustrating is the AI's frequent disregard for common-sense strategy: You're up, bases loaded, two out. You hit a clean grounder to second—and the computer throws home! Your runner scores easily, and you're standing at first wondering if you're playing the Bad News Bears. Most importantly, the game should have made the leap to a 3D API to take advantage of the 3D acceleration that every *boot* reader has by now.

But overall, *Triple Play 98* is a detail freak's dream. Score it a homer just over the 400-foot sign.

—Jon Phillips

boot verdict 8

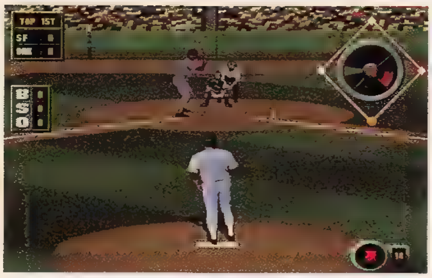
Price $50
Developer/Publisher
Electronic Arts
Phone 800.245.4245
URL www.ea.com

Grand Slam

Beating out a slow dribbler to shortstop, *Grand Slam* executes well in a few key areas. Pitching control is simultaneously precise and challenging: After choosing your pitch type and pinpointing a strike-zone location, you move on to a power/accuracy meter such as those found in golf games. If you continually go past the meter's red line, you'll blow out your arm. If you don't stop your return stroke, your pitch won't hit its target. Sim pitching becomes as stressful as sim batting. Splendid.

The game also boasts fast frame rates, quick arcade-style pacing, and scouting reports that pop up with every new batter. Unfortunately, these pluses are tempered by a slew of niggling minuses: an absurdly large ball, distant camera shots that remove you from the fielding action, and 2D sprites that don't look lifelike playing in otherwise passable 3D stadiums. Even worse is the total of four video-captured batters representing all 868 players. You'll also want to kill the annoying announcer who says things like "This is an important out for the pitcher," when you're pitching with a lead in the second inning.

Grand Slam is a good enough game in and of itself, but in the larger scope of baseball titles, it just barely reaches base safely.



Fast Direct3D frame rates and the pitching control meter (upper right) help Grand Slam *reach first base.*

CHECKLIST

Maximum Resolution/Color
640x480/16-bit
DirectX
Direct3D

Price $55
Developer Burst
Publisher Virgin Interactive
Phone 888.843.2661
URL www.vie.com

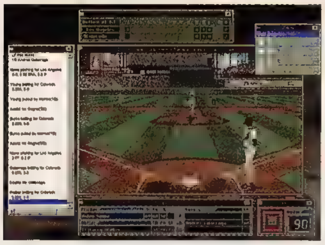
boot verdict 5

Baseball **Pro 98**

In a word, bizarre. *Baseball Pro 98* gives you an absurd amount of control over secondary elements such as stats, replay angles, and stadium physics, but sacrifices graphics, frame rate, and essential playability in the process. Do you really want to change the size of your players' gloves, adjust the probability of rain, or read a running log of every event that happens in the game?

The grief begins with the 2D, fixed size, 640x480 pitching/batting window. The action in this box should require little rendering power, but still moves in fits and starts on a P166 with good video. Once you hit a ball in play, action mysteriously switches to full-screen 3D that is so slow you could almost shut down and go to bed by the time your runner ambles into second with a stand-up double.

The bad gameplay doesn't jibe with the otherwise painstakingly defined detail. It's like a bunch of MIT researchers set out to recreate "baseball" without first consulting anyone who had ever actually played the game. Indeed, with different control windows strewn about the game's interface, *Baseball Pro 98* has the look and feel of a physical-events simulator.



Is this a baseball sim or the Wonderful World of Windows?

CHECKLIST

Maximum Resolution/Color
1024x768/8-bit
DirectX
DirectSound

Price $30
Developer Front Page Sports
Publisher Sierra
Phone 800.757.7707
URL www.sierra.com

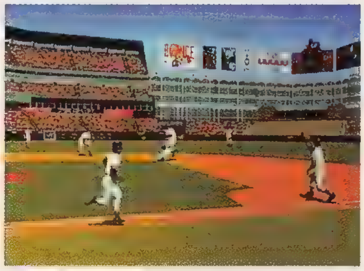
boot verdict 3

Tony La Russa Baseball 4

What's that? You don't want to actually play the game? Perfect. *Tony La Russa* is the sim for you. The coaching and general-manager modes give you great control over scouting, trading, lineups, bullpens, field positioning, substitutions, and all the other responsibilities of baseball's learned statesmen. Simply manipulate players in key situations as you engage in a nine-inning war of probability theory. If you're even less interested in ball and strikes, you can build a lineup, simulate an entire season in 10 minutes, and then investigate a full set of stats to check your G.M. prowess.

Unfortunately, gameplay and graphics are strictly Little League. The 3D-rendered stadiums are only slightly more appealing than the oversized 2D sprites that look like freakish pituitary cases running around the field in laughable stop-motion. In the pitching/batting screen, players appear in lifelike video capture, but alas, all competitors are identical white men. Timing your swing is unnecessarily difficult. When you do hit a ball into play, distant cameras track cartoonish play animations.

At the heart of *Tony La Russa* is a very fine management/statistics engine. You also get fascinating FMV clips of La Russa himself holding strategy clinics. A multimedia CD-ROM filled with La Russa's strategy instruction would be a category-creating winner. But, as it is, *Tony La Russa Baseball 4* is a flubbed play on the base paths.



The only good camera angles in Tony La Russa Baseball 4 *are found in replay mode.*

CHECKLIST

Maximum Resolution/Color
640x480/16-bit
DirectX
DirectSound DirectDraw
DirectPlay
Multiplayer
LAN Modem
Serial (two players maximum)

Price $40
Developer Stormfront
Publisher Maxis
Phone 800.336.2947
URL www.maxis.com

boot verdict 4

Creatures

Evolutionary leap

boot KICK ASS! PRODUCT

Get parental with *Creatures*. No, this isn't a game, it's a completely open-ended life sim, and it's a darn good one.

Hatch, educate, and breed your furry Norns in Albia, an animated 2½D environment. The interactive 2D platform environment has multiplane depth cueing so objects can appear in front of or behind each other. Scroll to follow your Norn around the screen.

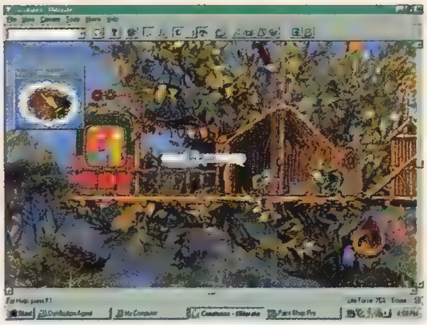
Creatures comes with six eggs (three male, three female) to hatch. You can have several Norns alive at once, but keeping track of more than six is demanding. Raising Norns involves monitoring their physical and psychological needs, teaching them a simple verb/noun language, and keeping them away from the disease-carrying Grendels.

Norns have a real-time life span of about 10 hours, during which they visibly age. Turn off your computer and your Norns go into suspended animation. They're complex little critters, independent life forms with biorhythms, a neural network, and metabolism, who learn by interacting with their environment. They can interact with about 40 objects including elevators, toys, and food.

Wave the cursor in front of your Norn to get its attention. Tickle it to reward good behavior and slap it when it's misbehaving. As Norns grow, characteristics such as laziness or inquisitiveness become apparent. You can even rate your parenting skills. Exchange Norns with your friends and they learn new behaviors.

The cool thing about Norns is that they fully emulate a living organism. They even breed. After several hours your Norns are mature enough to breed, which they do by nuzzling. Two hours of pregnancy and you have a Norn egg.

Each Norn has its own DNA sequence and genetic traits are combined in offspring. It's important to keep the gene pool fresh by exporting your Norns so they can interbreed, which you can do with other Norn owners and via the *Creatures* web site. (And if aberration is your passion, there's the potential for creating deviant Norns by genetically engineering them for particular characteristics and manipulating their genomes.) This sim is truly open ended.



Albia, the home of the Norn, is also inhabited by the reptile-like Grendel, which your Norn should avoid.

Norns are impressive little bundles of Artificial Life on your computer; a virtual pet like no other.

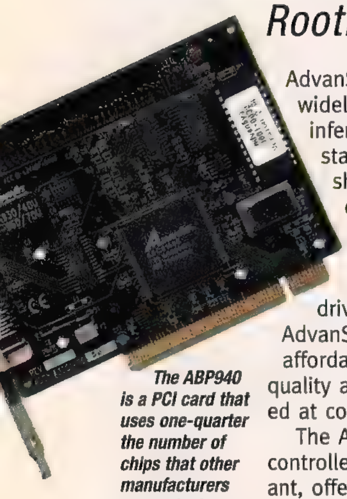
— *Ingrid Bush*

Price $40
Developer CyberLife Technology
Publisher Mindscape Entertainment
Phone 800.234.3088
URL www.mindscapegames.com

boot verdict 9

AdvanSys **ABP940 PCI Ultra** SCSI Host Adapter

Rooting for the underdog



The ABP940 is a PCI card that uses one-quarter the number of chips that other manufacturers use, reducing power consumption and adding reliability.

AdvanSys adapters are widely regarded as inferior by Adaptec standards, but they shouldn't be. Their cards are sold by VARs and OEMs such as Iomega to support their Jaz drives. However, AdvanSys' new line of affordably priced high-quality adapters are targeted at consumers.

The ABP940 Ultra SCSI controller is ASPI compliant, offers SCSI-1 and -2 support for up to seven devices, and uses a Bus Master DMA interface protocol. The BIOS contains all the configurations and diagnostics needed for easy set up and troubleshooting. It's well laid out for computer novices and the manual, included on disc in Adobe *Acrobat* format, clearly explains tech issues.

With support for DOS, Windows 3.x, 95, and NT, NetWare, and many flavors of Unix, the ABP940 offers benchmarks up there with the best. The only weak point: random reads from CD-ROM drives spewed varying results due to the erratic resetting of the drive head.

The *SuperView* software tracks down problems and kills them where they lay, and also provides comprehensive info about attached SCSI devices and the Registry. *Diskette Maker* software is also included for copying drivers to disk.

The ABP940 is powered by a 32-bit 40MHz RISC-embedded processor and 128-byte FIFO memory. AdvanSys claims its host adapters have twice the transfer speed of competing adapters due to their ASC1000 controller chip, which allows processing 255 simultaneous requests for data.

Dare to Compare

System Used: Pentium Pro 200MHz w/ Intel 450KX/GX chipset and 64MB of RAM	**Conner CFP1060S Hard Drive**		**Toshiba XM-3801TA CD-ROM Drive**	
	Adaptec AHA-2940	**AdvanSys ABP940**	**Adaptec AHA-2940**	**AdvanSys ABP940**
Adaptec Threadmark				
Data Transfer Rate (MB/sec)	2.20	2.42	N/A	N/A
Average CPU Utilization	22%	20%	N/A	N/A
SCSI Bench				
Random I/O (64K)	2015	2019	440	90–472
Random I/O (32K)	1354	1401	251	78–267
Random I/O (8K)	490	488	74	0–66
Sequential I/O (256K)	4409	4409	1541	1543
Same Sector I/O (64K)	8887	8958	881	976
Same Sector I/O (32K)	8176	8321	821	818
Same Sector I/O (8K)	5527	5872	4401	4571

With easy installation, OS compatibility, support, and pricing, everyone who uses SCSI should seriously consider this card.

— *Sean Cleveland*

Price $99
Developer AdvanSys
Phone 800.525.7443
URL www.advansys.com

boot verdict 8

Mean **Greens**

Three new golf sims with all the fixins

There's a battle being waged inside your PC. The combatants are armed with clubs, spiked shoes, little white balls, and funny hats. At stake are tranquil landscapes filled with perpetually mowed fairways and manicured greens. To the victor goes a dry martini. Let the Golf Wars begin. — *Scott May*

British Open: Championship Golf

British Open: Championship Golf heralds the return of Rex Bradford, designer of one of the first golf sims, Accolade's *Mean 18.*

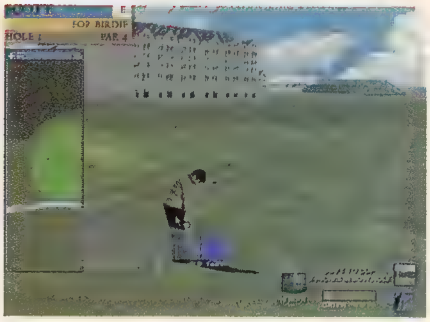
The proprietary game engine is standard stuff, rendering the graphics front-to-back in real time, incorporating MIP-mapped antialiased polygon terrain, Gouraud texture-shaded *3D Studio Max* models, video-captured golfers, processed photography, and hand-drawn bitmaps. The perspective-correct terrain recreates the burned grass look of St. Andrews' weathered links. Combined with the barren Scottish landscape, the results are authentic to the point of being drab—proving realism ain't always pretty. Up to four players—human or computer controlled—compete in practice, stroke, best ball, match, and multi-round tournaments. Other high points include an interactive video-captured caddie, and Jim McKay's remarkable play-by-play commentary.

Low points include a hypersensitive, slice-inducing swing meter and lack of remote multiplayer options. Flight dynamics are realistically affected by atmospheric conditions (wind, temperature, and humidity), but take a nose dive when chipping to the green, where the ball appears to hit a glass wall, dropping abruptly to the turf.

Despite its quirks and glaring omissions, *British Open: Championship Golf* is a solid performer. Unfortunately, these desolate links—historic or not—are dull.

CHECKLIST

Maximum Resolution/Color
1024x768/16-bit
Win95 Native
DirectX
DirectDraw DirectSound
DirectPlay



Price $50
Developer/Publisher
Looking Glass Technologies
Phone 617.441.6333
URL www.lglass.com

boot verdict 6

Front Page Sports: Golf

Designed by Vance Cook, co-creator of the *Links* series, *Front Page Sports: Golf* offers the first tangible alternative to the dreaded swing meter. TrueSwing transforms your mouse into a real-time virtual club. Simply pull back for backswing, forward for power, and side-to-side for snap. Once you learn the mechanics, TrueSwing provides unprecedented control. For traditionalists, a tri-click swing meter is also available.

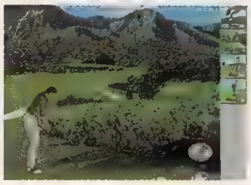
Two courses are included, both real-time rendered at 1024x768 and 16-bit color. The MIP-mapped polygon terrain and digitized background objects are drop-dead gorgeous, even without 3D hardware acceleration. Yet the game foregoes complete photorealism with its 3D textured-polygon golfers. To be fair, the 2,000 polygonal characters enable more fluid and expressive animation than video capture.

Internet play is available via Sierra's free gaming server, allowing up to 64 players in online tournaments. The game also offers 12 styles of play—the most of any golf sim to date—including team variations of medal, match, skins, best ball, scramble, and Stableford.

Despite five simultaneous camera views, the game's biggest weakness is in visually tracking the ball in flight. Otherwise, this is a top-notch sim, sporting an unobtrusive interface, and fast screen redraws.

CHECKLIST

Maximum Resolution/Color
1024x768/16-bit
Win95 Native
DirectX
DirectDraw DirectSound
DirectPlay
Multiplayer
Modem LAN



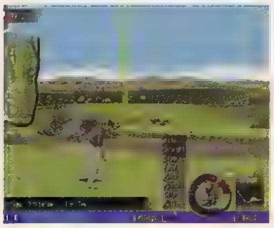
Price $55
Developer/Publisher
Sierra On-Line
Phone 800.757.7707
URL www.sierra.com

boot verdict 8

PGA Tour Pro

Beyond a few additions, *PGA Tour Pro* doesn't tinker with success.

The game is rendered in real time with a combination of textured polygons and sprite-based graphics. Unlike most golf sims, which redraw the graphics on screen—typically front-to-back—EA's proprietary Flash Draw renders completely in the background, then flashes the entire screen.



Graphics quality is good, but a low tile count, particularly in the foreground terrain, results in a flat look.

Two 18-hole links are packaged with the game, with more promised. Game styles include practice, stroke, shootout, skins, and tournament play. The most important new feature is multiplayer mode. Up to 80 people—20 foursomes—can compete in online tournaments, using the built-in connection to EA Sports Net.

Other improvements include the ability to walk the course; a "risk meter" to gauge difficulty; and hole fly-bys. On the downside, EA has changed its once-unique swing overlay to a more traditional circular meter.

If Win95 online gaming is your prime consideration, *PGA Tour Pro* is worth the upgrade. If not, stick with EA's previous DOS-based *PGA Tour* titles, which are still among the best in the business.

CHECKLIST

Maximum Resolution/Color
800x600/16-bit
MMX Enhanced
DirectX
DirectDraw DirectSound
DirectPlay
Multiplayer
Modem LAN Internet

Price $55
Developer/Publisher
Electronics Arts
Phone 800.448.8822
URL www.ea.com

boot verdict 6

Control Freaks

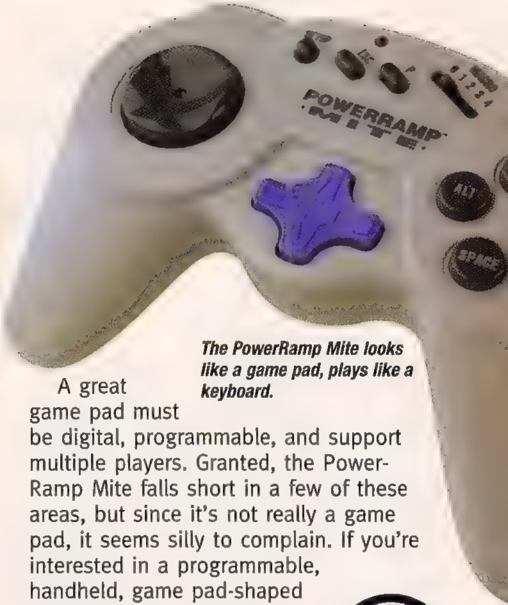
Firepower at your fingertips

PowerRamp Mite

The PowerRamp Mite plugs directly into the keyboard port rather than a traditional game port (both AT and PS/2 pass-through connectors are included) and is really nothing more than a handheld—albeit limited—keyboard masquerading as a game pad. Still, that's not a bad thing and the PowerRamp Mite is a pretty good fake.

Slightly bigger than Gravis' GamePad Pro, the PowerRamp Mite is reminiscent of a PlayStation pad—four triggers are located at the rear, with the rest of the buttons assuming regular positions on the top. Although all the buttons are programmable (depending on the button, for either two, six, or 10 separate game functions), they also perform traditional keyboard commands, such as Alt, Delete, and Enter, when set in default mode. Luckily, they're clearly marked, so confusion is minimal. The pad is comfortable, and none of the buttons are out of place. The D-Pad, in particular, has great tactility.

But just as the keyboard isn't suited for flight sims or games requiring precise control, the PowerRamp Mite is best with twitch games or fighting games requiring an arsenal of easily accessed firepower. Remapping the buttons is simple—press the setup button, type in the command, and you're ready to rumble. There are also allowances for special multikey combos, keyboard modifiers, pauses, and continuous movements. The designated macro key can be used to store independent game settings, or if you're daring, use it as a complex, four-tiered control set. There's no programming interface, so you can't print control settings, but you can remap buttons on the fly. It doesn't get much simpler than this. And with the 10-keyboard-move limit, the chance for a buffer overload is minimized—unless you perform the 20-plus moves simultaneously.



The PowerRamp Mite looks like a game pad, plays like a keyboard.

A great game pad must be digital, programmable, and support multiple players. Granted, the PowerRamp Mite falls short in a few of these areas, but since it's not really a game pad, it seems silly to complain. If you're interested in a programmable, handheld, game pad-shaped keyboard, the PowerRamp Mite is for you.

boot verdict 6

Price *$30*
Company *ACT Laboratory*
Phone *800.980.9997*
URL *www.actlab.com/gamegear*

The Digital Extreme's solid construction consists of dual molded ABS plastic.

WingMan Digital **Extreme**

The WingMan Digital Extreme doesn't appear drastically different from the original analog version. But with new and enhanced features—including a programmable digital interface—the WingMan Digital Extreme manages to pack two-and-a-half pounds of Teflon-coated, armor-piercing ammo into the palm of your hand. And that ain't half bad.

Sporting the same ergonomic handle, 4-way hat switch, and steel-weighted base of the previous incarnation, the Digital Extreme has six fire buttons (including a trigger) and a miniature arced throttle. Trim controls have been yanked, thanks to the infinitely cooler—and more responsive—digital interface. The santoprene-coated components are responsive and feel great for extended periods of time.

Unlike other Win95-only controllers (such as Logitech's CyberMan 2 and Microsoft's SideWinder GamePad), the WingMan Digital Extreme will work in DOS, albeit in the two-axis, four-button true-analog (not emulated) mode of the original (and much older) CH Flightstick, WingMan Extreme, and ThrustMaster controllers. Unfortunately, the hat switch is only active in games directly supporting the WingMan Extreme and ThrustMaster products, and the throttle only works with games supporting the CH Flightstick. Still, for a DOS device, the Digital Extreme is a good one.

The WingMan Digital Extreme is better suited for play under Win95. A robust GUI lets you program and remap the fire buttons. The interface is slick but the smattering of game control sets Logitech includes is disappointing (a visit to Logitech's web site reveals more than 40 control sets for downloading, but most are for ancient games). Luckily, creating new control sets takes seconds, and you'll have an arsenal of them ready in no time. As good as it is, the programming interface has a few flaws: you can't assign separate commands for button press and release; you can only assign single keystrokes, not macros or long-winded cheat codes; and you're limited to 20 characters when naming the control sets.

Still, in combat—and for games such as *Comanche 3* and *X-Wing vs. TIE Fighter*—the WingMan Digital Extreme performs admirably. Its killer interface and excellent functionality make it one boffo controller.

— *Bryan Del Rizzo*

boot verdict 8

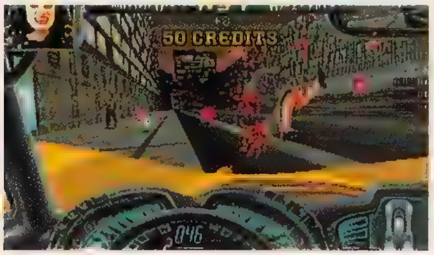
Price *$50*
Company *Logitech*
Phone *800.231.7717*
URL *www.logitech.com*

Carmageddon

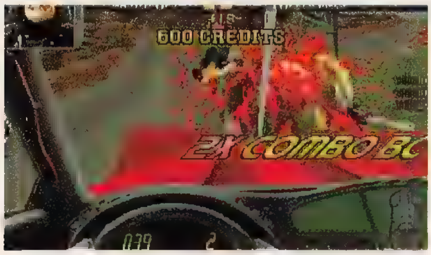
Red asphalt

TRY IT ON THE DISC

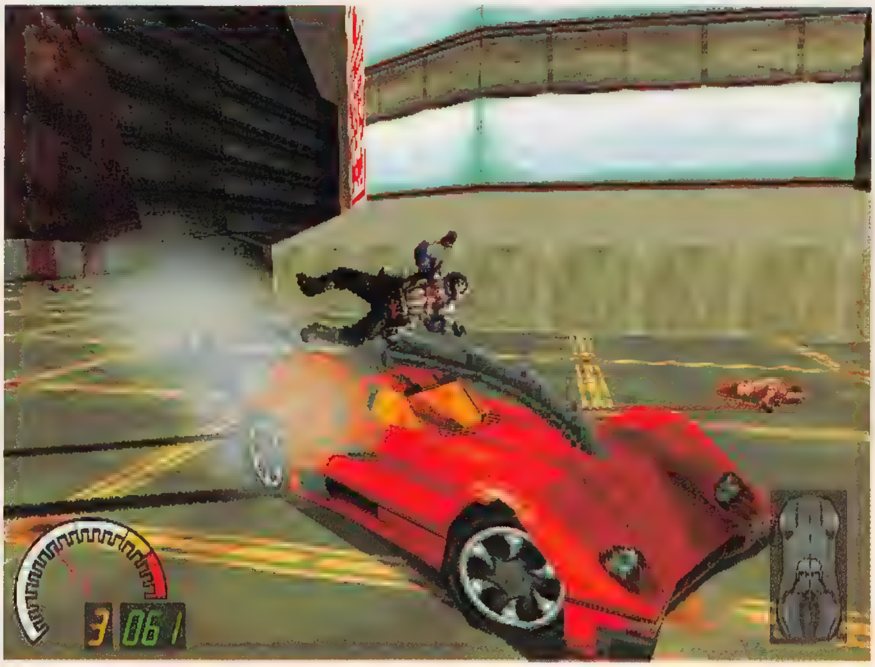
It's open season on innocent bystanders, so put the pedal to the metal and pulverize any pedestrian who can't get out of the way. *Carmageddon* is an arcade racing game that's not for the timid—there's so much unabashed gore here that *Quake* looks like *Sesame Street On Ice*. Too bad such intense gaming is hindered by substandard graphics.



Pedestrians are no match for your big-block brutality.



***Tear into some wholesome bovines in* Carmageddon.**



Carmageddon *offers a 640x480 SVGA mode—in the DOS version—but you can forget about slick frame rates.*

The abattoir atmosphere of *Carmageddon*'s perspective-correct, texture-mapped polygon world is spoiled only by the even more grotesque 320x200 graphics. A 640x480 SVGA mode is only available in the DOS version (a Win95 version is forthcoming) but skip it. Frame rates drop way below unacceptable levels at high res, even on a 266MHz Pentium II! When you're using the BRender rendering engine (which is optimized for MMX) and can barely reach double-digit frame rates on a P233, it's time to check the code. Sure, you *could* crank down the graphics to suit your needs, but this game screams for 3D acceleration. Until the 3Dfx patch comes out, you'll have to enjoy the 20+fps the VGA coughs up.

Carmageddon also suffers from *really* bad terrain redraw, which means canyon walls spring up miraculously on the horizon like sea monkeys in a glass of water. 2D sprites are abundant, with horrified church picnickers and grazing Holstein exploding in a grisly spray of bitmapped blood and innards—*Carmageddon* wins extra style points for its particularly artistic vehicular manslaughter. Thankfully, there's an abundance of visual detail, such as the trail of bloody treadmarks left as you run over corpses, sparks issuing from metal on concrete, and smoke billowing from damaged vehicles.

Carmageddon's bloodthirsty action and great physics model save it from crashing into the junkyard. And although it isn't a fancy NASCAR sim, each car has a distinct feel: the souped-up Cadillac rolls in style and turns like a tank, while the massive bulldozer moves as slow as molasses but packs a granite punch if you're on the receiving end of a ram attack. Fail to navigate the massive loop-de-loop and you'll toss your cookies as you tumble helplessly to the cruel pavement. Topple into the water and the front-end buoyancy plagues sudden acceleration.

While ruthless enemy AI harasses your every move, and smashing into hapless bystanders *is* plenty of fun, nothing brings out the bloodlust like multiplayer mayhem. Catch a co-worker off guard, crush their car into a wall and lift the vehicle off the ground, and listen to the screams in the next cubicle. Destroy each other in a free-roving fragfest or go for maximum kills. A variety of power-ups await—including armor enhancements, engine boosts, and sticky tires—to enhance your destructive tendencies.

Carmageddon's over-the-top first- or third-person slaughterhouse style and intense gameplay make this a keeper for the sick and twisted, but ridiculous SVGA frame rates and flawed graphics prevent it from getting the checkered flag.

— *Andrew Sanchez*

CHECKLIST

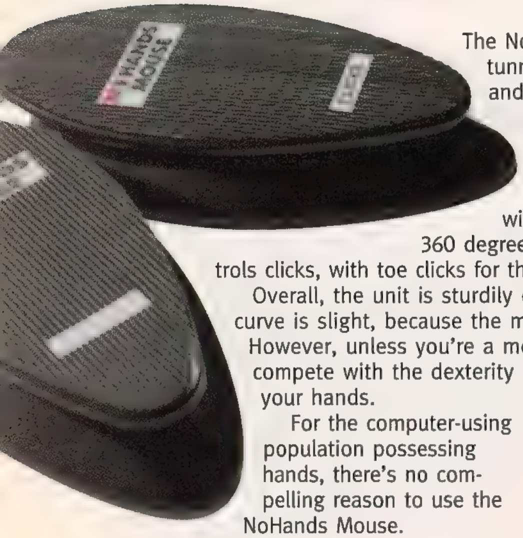
Maximum Resolution/Color	640x480/16-bit
MS-DOS Native	
Win95 Native	
3D Software Acceleration	BRender
3D Hardware Acceleration	3Dfx (promised)
Multiplayer	IPX
MMX Enhanced	(via BRender)
Specialty Controllers	Steering Wheel

Price $45
Developer Sales Curve Interactive
Publisher Interplay
Phone 800.468.3775
URL www.interplay.com

boot verdict
6

NoHands Mouse

NoBrainer peripheral



The NoHands Mouse is supposed to relieve carpal tunnel syndrome by obviating the desktop mouse, and increase productivity because your hands need never leave the keyboard. RSI sufferers are better off with an ergonomic keyboard.

Simply place your feet on the 10-inch foot pads. One pad consists of a stationary base with a pressure-sensitive pedal on top that pivots 360 degrees controlling cursor movement, the other controls clicks, with toe clicks for the left mouse button, the heel for the right.

Overall, the unit is sturdily constructed, setup is simple, and the learning curve is slight, because the mouse is an inherently intuitive device. However, unless you're a monkey, your feet just can't compete with the dexterity of your hands.

For the computer-using population possessing hands, there's no compelling reason to use the NoHands Mouse.

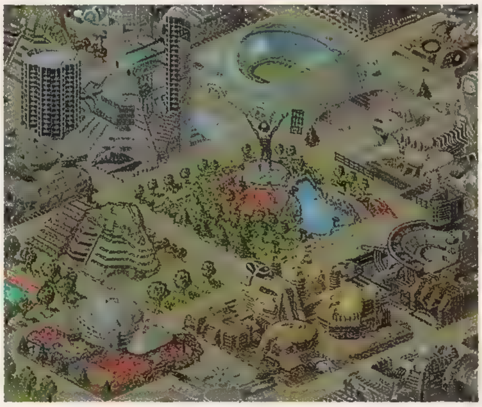
— *Ingrid Bush*

Price $120
Company Hunter Digital
Phone 800.576.6873
URL www.nohandsmouse.com

boot verdict 3

Imperium Galactica

A little of this and a little of that



As in *Master of Orion II*, *Imperium Galactica* has you conquering planets in your attempt to attain the ultimate goal: galactic conquest. Along the way you research and develop technology to aid you in conquering and colonizing the planets. Developing each planet's infrastructure is done via a *SimCity*-like mode. Finally, as your empire expands, you must protect the planets from a variety of threats and disturbances with a real-time combat system similar to *Command & Conquer*'s.

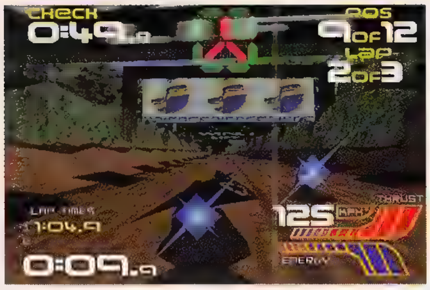
Imperium Galactica doesn't break new technological ground either. All the 3D art, including cinematics, is dark and dull. It's obvious the source art was rendered at a higher color depth and then palettized to 256 colors. However, the hand-drawn art, such as the city close-ups, is nicely anti-aliased and animated. The full-screen cinematics run at 320x200, unlike the rest of the game which displays at 640x480. Although the compression algorithm used shows little artifacting, the scenes are muddy. This is disappointing, given that the hour-plus of cinematics were billed as one of the game's high-points.

Although *Imperium Galactica* has a simple point-and-click control scheme and is easy to get into, it's also unlikely to hold your attention for nearly as long as *Master of Orion II*. A multiplayer option would have greatly enhanced this game's longevity.

— *André Vrignaud*

Price $35
Developer Digital Reality
Publisher GT Interactive
Phone 800.469.5961
URL www.gtinteractive.com

boot verdict 6



Wipe**Out** XL

A sheep in wolf's clothing

TRY IT ON THE DISC

WipeOut XL for the PlayStation combined the breakneck pace of a futuristic racing game with the furious action of an arcade shooter. Armed with a mighty arsenal of 3D accelerator patches, the PC version of *WipeOut XL* should kick some serious ass. Unfortunately, it's a timid sibling compared to its ballistic brethren.

Instead of careening the racetrack at blistering speeds, you're left with the sensation of slogging along squeezed into the back seat of a Pinto. Sure, the graphics are lusciously detailed at 800x600 on a 3Dfx card, complete with falling snow, and steaming pipes, but pretty graphics only go so far. The frame rate is smooth (at 20fps to 24fps) with nothing else on screen, but severely bogs down (to 15fps and below) when one or more ships are on screen. This, combined with sticky key response, drives gameplay to keyboard-smashing frustration.

The overdriven sound quality is loathsome, turning every sound effect into a buzzing crunch. The original techno soundtrack provided by Underworld and their electronic ilk is absent. Instead, Psygnosis opted for their in-house musician, resulting in a tediously repetitive soundtrack. The final nail in the coffin of this sorry game is the lack of multiplayer support. "Multiplayer" throbs through the veins of every gamer worth their salt, and to deny them this is unthinkable. Despite its potential, *WipeOut XL* on the PC comes off as a lackluster game that ultimately adds little to the racing genre, or to a gamer's library.

— *Dan Simpson*

Price $55
Developer/Publisher Psygnosis
Phone 800.438.7794
URL www.psygnosis.com

boot verdict 5

Viviprint **DigiPhoto**

Fotomat in a box

You don't have to run out to your local photo processor to get true photographic-quality prints. All you need is a digital camera and the new ViviPrint DigiPhoto dye-sublimation printer to get 24-bit color images that approach film quality, with saturated colors and clear details. It even lays down a glossy finish.

The DigiPhoto prints 4x6-inch images on its own paper at 203x203dpi. It can print with borders, like a Polaroid, or straight to the edge. Prints have crisp, clean details with excellent highlights and colors.

Like most dye-sublimation processes, the printer lays down each color in a separate pass, so each image takes at least 15 minutes to print. But since the process applies heat to color ribbons, vaporizing the pigments onto specially coated paper, you get continuous-tone images with no dithering. On top of the color ribbons (cyan, magenta, and yellow), the DigiPhoto uses a ribbon of clear plastic to laminate and protect the print. This glossy protection helps keep your prints from smudging with fingerprints or getting bleached by the sun.

You'll never have to wait for your pictures to be developed or hand over your film to a stranger again. Although such privacy and convenience do have a price: The Print Film Kit, which comes with enough ribbon and photo paper for 36 prints, costs $35. With separate print kits available for creating photo mugs and vinyl photo stickers this makes for a great do-it-yourself print shop, but with prints costing almost a buck a pop, your local photo mart won't be going out of business any time soon.

— Sean Downey

on off
clear

Get photographic-quality prints with the DigiPhoto dye-sublimation printer, without ever leaving the privacy of your home.

Price $400
Developer/Publisher Vivitar
Phone 805.498.7008
URL www.vivitar.com

boot verdict 6

FreeBoard Beamer

Quake from the couch

So you've finally managed to get the wires strung across the ceiling or under the carpet so you can play PC games on your TV and it looks great. Just one problem: you keep tripping over the keyboard cable stretched taut from the desk. IR is the answer, and the FreeBoard Beamer is one excellently designed IR keyboard for the job.

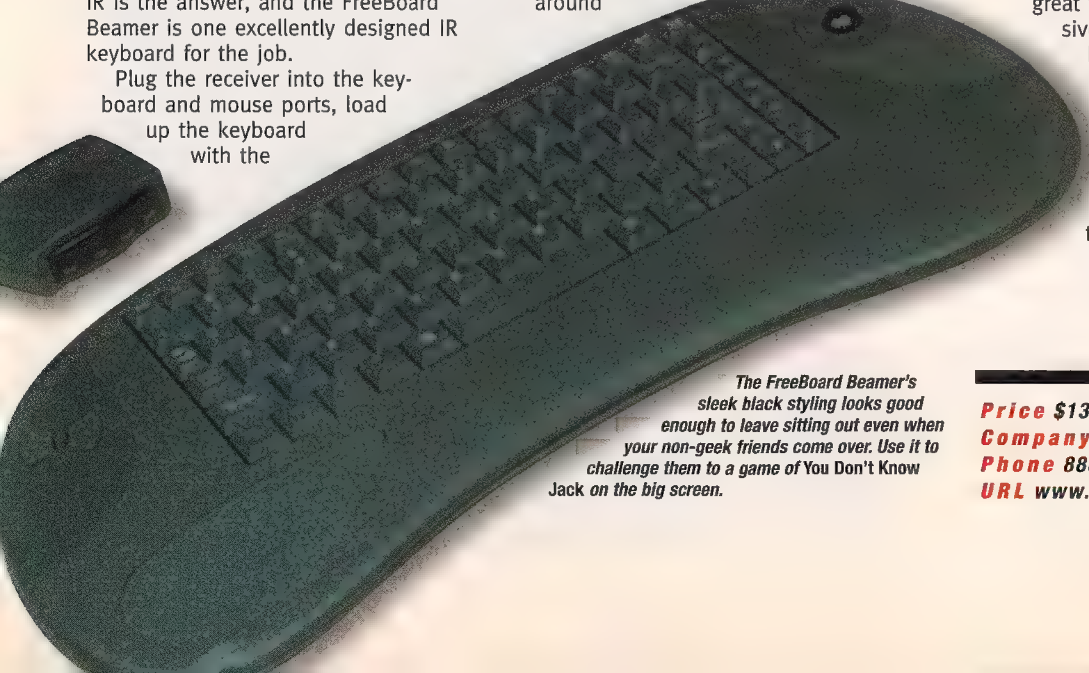
Plug the receiver into the keyboard and mouse ports, load up the keyboard with the eight included AA batteries, and set the range switch to short (10 feet), medium (20 feet), or long (30 feet) to balance distance vs. battery life, and you're set.

The FreeBoard has three IR transmitters around its perimeter, so no matter how you angle yourself, the odds are good that a clear signal will get through, and it automatically powers off and on in response to your input—no need for a power switch.

The keyboard and trackball have a great feel, and are more than responsive enough to play *Quake*, much less type a review. Even from a partially obstructed location across the room, there's not the slightest mouse lag or missed keystrokes.

The FreeBoard Beamer lets you break the leash that ties you to your desk!

— Chris Dunphy



The FreeBoard Beamer's sleek black styling looks good enough to leave sitting out even when your non-geek friends come over. Use it to challenge them to a game of* You Don't Know Jack *on the big screen.

Price $139
Company Sejin
Phone 888.373.3273
URL www.sejin.com

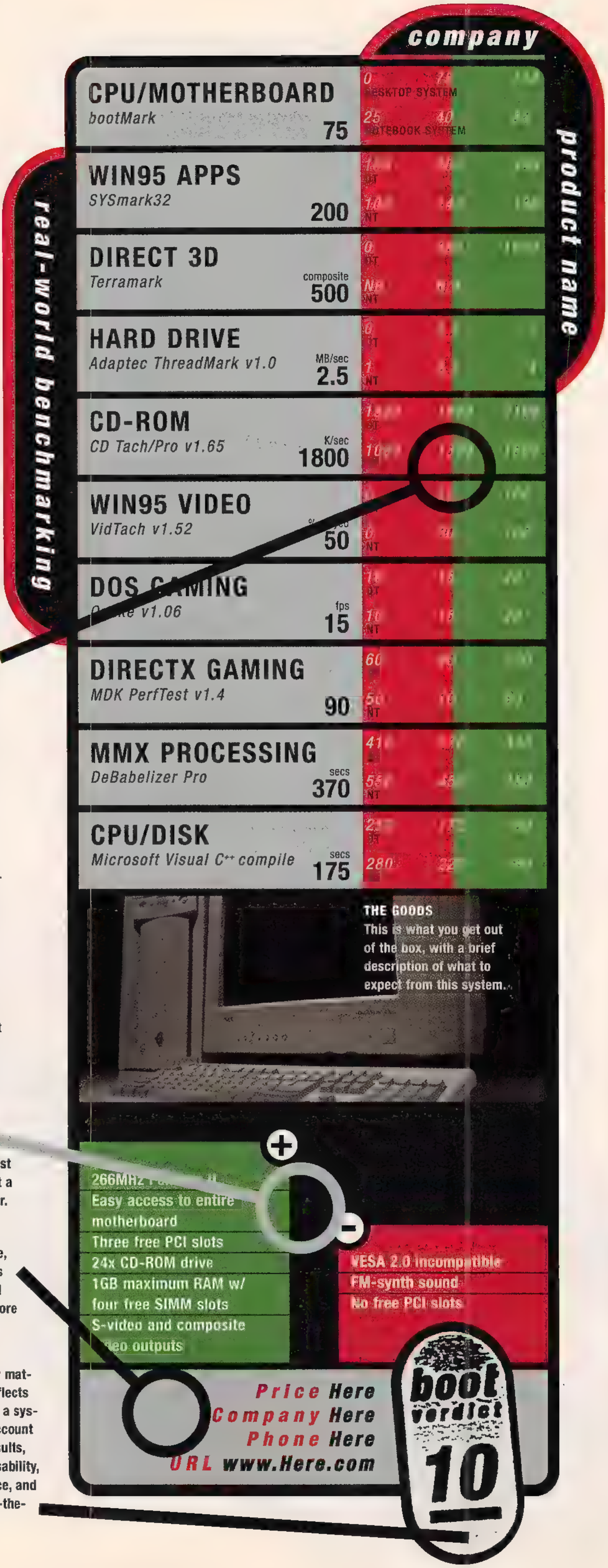
boot verdict 9

bootLab **Policy**

***boot** isn't like any other computer magazine, and neither is our product-**evaluation** process. We don't test equipment in the cold, sterile environment of a warehouse-size lab, and we don't write our reviews based on the **test scores** that labcoat-wearing technicians scribble on clipboards.*

*Our review **scores** are based on a combination of objective **benchmark** testing, real-world performance, and our subjective evaluation of features, performance, and the many less tangible **characteristics** that go into a product. All of our evaluations are based on **hands-on** use of the product.*

Only the **best** earn enough respect to be worthy of our **editors'-choice** award.



CPU/MOTHERBOARD	*bootMark*		75
WIN95 APPS	*SYSmark32*		200
DIRECT 3D	*Terramark*	composite	500
HARD DRIVE	*Adaptec ThreadMark v1.0*	MB/sec	2.5
CD-ROM	*CD Tach/Pro v1.65*	K/sec	1800
WIN95 VIDEO	*VidTach v1.52*	% [illegible]	50
DOS GAMING	*Quake v1.06*	fps	15
DIRECTX GAMING	*MDK PerfTest v1.4*		90
MMX PROCESSING	*DeBabelizer Pro*	secs	370
CPU/DISK	*Microsoft Visual C++ compile*	secs	175

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−
- VESA 2.0 incompatible
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- No free PCI slots

Price Here
Company Here
Phone Here
URL www.Here.com

boot verdict
10

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CONTACTS
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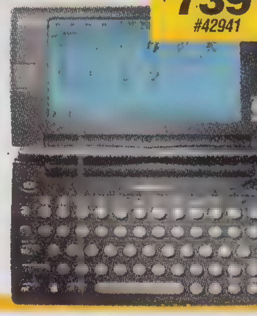

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S8C***	MMX 166MHz	3.1GB	32MB/128MB	16X	33.6 D/F/V†††	#42427	$1699	$68	$159.98
S80°	MMX 166MHz	3.2GB	32MB/128MB	8X	33.6 D/F/V†††	#42368	$1999	$80	$159.98
S9C**	MMX 200MHz	4.0GB	32MB/128MB	16X	33.6 D/F/V†††	#42428	$2299	$92	$189.98
S3C	MMX 233MHz	4.2GB	32MB/128MB††	16X	33.6 D/F/V†††	#48812	$2599	$104	$189.98
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AMS Tech	TravelPro	188CT	MMX 166	2.1GB	16MB	12X	6.1lbs	12.1" SVGA DS	#47338	$2999
AMS Tech	TravelPro	2000CX	P150	2.1GB	16MB	10X	6.3lbs	13.3" XGA TFT	#42931	$3699
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AST	Ascentia	P 70	MMX 150	3.1GB	32MB	10X	7.1lbs	12.1 SVGA TFT	#42413	$3999
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IBM	ThinkPad	760ED	P133	2.1GB	16MB	6X	6.6lbs	12.1" XGA TFT	#36737	$4399
Kiwi	OpenNote	680C	P133	1.1GB	32MB	6X	6.0lbs	11.3" SVGA DS	#42985	$1699
Kiwi	OpenNote	680M	MMX 150	2.0GB	32MB	6X	6.0lbs	11.3" SVGA TFT	#42986	$3399
NEC	Versa	2530	P133	1.0GB	16MB	-	6.9lbs	12.1" SVGA TFT	#42980	$1699
NEC	Versa	6030X	P133	1.44GB	16MB	6X	7.0lbs	12.1" XGA TFT	#34173	$3999
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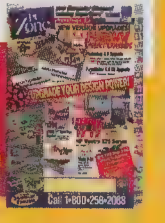

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#85646 Pilot HotSync Cable	$18.98
#44280 Palm Pilot Modem AC Adapter	$18.98
#85648 Pilot Slim Leather Carrying Case	$24.98
#82788 Pilot Custom BeltClip Case	$24.98
#85643 Pilot Cradle	$28.98
#82026 Pilot Deluxe Leather Carrying Case	$54.98
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Ink Jet	Max. Std. Resolution	Page per Min. B&W/Color	PS Fonts/ TT Fonts	RAM Std./Max.	Max. Paper Size	Warranty (Years)	Item #	Price
Lexmark Color JetPrinter 1020	600x300	3/2	–	29K	8.5x14"	2	#31815	$149.98
Canon BJC-240	360x360	3/.27	7/300	62K	8.5x14"	1	#34188	$178.98
Canon BJC-4200	720x360	5/1	7/300	64K	8.5x14"	1	#34189	$278.98
Canon BJC-620	720x720	4/1.7	7/300	60K	8.5x14"	1	#34190	$329.98
Canon BJC-4550 Wide	720x360	5/1	7/300	64K	11x17"	1	#34191	$499.98
Canon BJC-70 Portable	720x360	4/.8	7/20	35K	8.5x14"	2	#21969	$299.98
EPSON Stylus Color 400	720x720	4/3	1	56K	8.5x44"	2	#80666	$229.98
EPSON Stylus Color 600	1400x720	6/4	5/4	56K	8.5x44"	2	#80667	$299.98
EPSON Stylus Color 800	1400x720	8/7	1	64K	8.5x44"	2	#80668	$449.00
EPSON Stylus Color 1500	720x720	3/1	5/4	256K	13.6x21.78"	2	#86318	$799.98
HP DeskJet 340 Portable	300x300	3/2-4	6/0	16K	8.5x14"	1	#27969	$279.98
HP DeskJet 672C	600x300	5/1.5	0/32	512K	8.5"x banner	1	#40979	$199.98
HP DeskJet 694C	600x600	5/1.7	8/35	512K	8.5"x banner	1	#40994	$299.98
HP DeskJet 820Cse	600x600	6.5/4	0/50	128K	8.5x14"	1	#86326	$299.98
HP DeskJet 870Cse	600x600	8/4	26/126	1MB	8.5x14"	1	#36156	$399.98
HP DeskJet 1600C	600x600	9/4	1/35	4/100MB	8.5x14"	1	#31068	$1349.00
HP OfficeJet 1150C	600x300	8/4	125	512K	8.5x14"	1	#40999	$999.98

Laser	Max. Std. Resolution	Page per Min. B&W/Color	PS Fonts/ TT Fonts	RAM Std./Max.	Max. Paper Size	Warranty (Years)	Item #	Price
Brother HL-720 Windows	600x600	6	0/35	512K/2MB	8.5x14"	1	#31838	$349.98
Brother HL-730 DOS/Windows	600x600	6	0/35	512K/2MB	8.5x14"	1	#34168	$399.98
HP LaserJet 6Lse	600x600	6	0/26	1/9MB	8.5x14"	1	#41022	$399.98
HP LaserJet 6MP	600x600	8	35/75	2/50MB	8.5x14"	1	#82666	$949.98
HP LaserJet 6Pse	600x600	8	35/75	2/50MB	8.5x14"	1	#41036	$799.98
HP LaserJet 5se	600x600	12	0/110	4/66MB	8.5x14"	1	#41021	$1099.00
Okidata OP4W	600x600	4	–	128K	8.5x14"	1	#34167	$299.98
Okidata 16n	600x600	16	35/10	6/34MB	8.5x14"	1	#40988	$999.98
Lexmark Optra E	600x600	6	0/26	1/5MB	8.5x14"	1	#31817	$429.98
Lexmark Optra Rt+	1200x1200	16	39/45	4/64MB	8.5x14"	1	#36049	$1479.00
Lexmark Optra N	600x600	24	39/45	4/64MB	8.5x14"	1	#35278	$2679.00
Lexmark Optra C	600x600	12	39/45	8/64MB	11x17"	1	#87253	$5900.00

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41195 Home/Office FaxModem Ext 33.6 *After $10 Mfr. Mail-in Rebate. Low Zone Price $105.98	$95.98*
Global Village	
38436 Teleport 33.6 InterNet Ed SpeakerPhone	$87.57
46256 Teleport 56K x2 Int. Faxmodem	$145.98
46257 Teleport 56K x2 Ext. Faxmodem	$154.98
46325 Global Village 56K Flex Fax/Modem PC Card	$208.98
46324 Global Village 56K Flex Modem/Ethernet PC Card	$288.98
Supra	
82558 Supra FaxModem 336 PC External	$151.00
32631 SupraExpress 336e PS External	$80.00
32630 SupraExpress 336i PnP Internal	$64.00
32632 SupraSonic 336V+ Ext Voice/FaxModem	$179.98
U.S. Robotics	
41280 Sportster WinModem 33.6 Internal *After $40 Mfr. Mail-in Rebate. Low Zone Price $98.75	**$58.75***
41284 Sportster V.34 33.6 Ext FaxModem *After $40 Mfr. Mail-in Rebate. Low Zone Price $153.28	$113.28*
41283 Sportster V.34 33.6 Int FaxModem *After $40 Mfr. Mail-in Rebate. Low Zone Price $121.00	$81.00*
41282 Sportster Voice 33.6 Ext FaxModem *After $40 Mfr. Mail-in Rebate. Low Zone Price $171.75	$131.75*
41281 Sportster Voice 33.6 Int FaxModem *After $40 Mfr. Mail-in Rebate. Low Zone Price $144.27	$104.27*

Scanners

Artec Ultima	
38456 ScanRom Pro/4E	$152.22
31805 ViewStation A6000C-Plus	$266.60
38933 Viewstation AT-3	$184.44
Hewlett-Packard	
40973 HP ScanJet 5pse	$376.80
Logitech	
32596 PageScan Color Pro w/ADF	$309.54
32597 ScanMan Color 2000 Parallel	$119.29
MicroTek	
25688 Page Wiz	$88.89
36165 ScanMaker E3 PC Standard	**$179.98**
36166 ScanMaker E6 Standard	$359.00
Minolta	
38405 Snappy 2.0	$188.83
UMAX	
41001 Astra 300P	$199.98
45658 Astra 600S	$235.56
83510 PowerLook II w/Full Photoshop	$1395.00
36185 PageOffice Color Scanner	$187.78
Visioneer	
43651 PaperPort IX w/4.0 Software	$266.67
43652 PaperPort MX f/Windows	$221.11

Digital Cameras

Connectix	
23941 Color QuickCam *After $20 Mfr. Mail-in Rebate. Low Zone Price $99.98	$79.98*
46840 Color QuickCam & Video Phone2 v2	$225.22
Epson	
82659 PhotoPC 500 Color Digital Camera	$499.98
82665 PhotoPC 500 LCD ViewFinder	$199.98
Kodak	
44531 DC120 Digital Camera	**$179.98**
84968 DC20 Digital Science Camera	$199.98
82413 DC25 Digital Camera	$499.98
86848 DC50 Digital Camera	$699.98
37247 Kodak 2MB Picture Card w/Adapter	$119.98
86306 Kodak 4MB Picture Card f/DC50	$149.98
31066 Universal AC Power Supply f/DC40 & DC50	$59.98
Olympus	
37253 D-200L 2MB Digital Camera	$599.98
82179 D-300L 6MB Digital Camera	$899.98
Ricoh	
82972 RDC-1 Digital Camera	$1949.00
37216 RDC-2 Digital Camera w/Monitor	$799.98
37217 RDC-2 Digital Camera w/o Monitor	$649.98
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37223 Ricoh DR-2 Remote Control f/RDC-2	$27.98
82971 Ricoh DW-1X Wide Angle Lens Adpt. f/RDC-1	$179.98
37219 Ricoh FA-10 10MB Memory Card f/RDC-2	$429.98
37220 Ricoh FA-20 20MB Memory Card f/RDC-2	$739.98
37218 Ricoh FA-5 5MB Memory Card f/RDC-2	$284.98
82967 Ricoh FD-FC 24MB Memory Card f/RDC-1	$1400.00
82966 Ricoh FD-FC 8MB Memory Card f/RDC-1	$399.98
82968 Ricoh SC-1 Case f/RDC-1	$34.98
37222 Ricoh SC-2 Case f/RDC-2	$39.98

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38731 3D XpressionPlus 4MB PCI	$117.81
38732 3D XpressionPlus PC2TV 2MB (PCI)	$169.98
38733 3D XpressionPlus PC2TV 4MB (PCI)	$184.73
Hercules	
31846 Dynamite 128 PCI 2MB MDRAM	$98.18
38720 Dynamite 128/Video 4MB MDRAM	$124.74
31847 Terminator 3D 2MB EDO DRAM	$109.72
38721 Terminator 3D 4MB PCI EDO DRAM	$139.35
31849 Terminator 64/Video PCI 2MB EDO DRAM	$74.44
Matrox	
34281 MGA Millenium 3D WRAM 4MB PCI	$201.32
Number Nine	
34531 9FX Reality 332 (2MB DRAM PCA)	$120.11
39169 9FX Reality 772 4MB EDO VRAM PCI Video	$242.56
24836 9FXMotion 771 2MB VRAM PCI	$195.56
TrueVision	
27633 Bravado 1000 for Windows	$576.67

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25477 Adesso Tru-Form Ergonomic Keyboard w/o Pointer	$37.65
32623 Adesso Tru-Form w/TouchPad	$65.88
25447 Tru-Form Ergonomic Keyboard w/Pointer	$47.06
Key Tronic	
30638 LifeTime Wireless Keyboard w/TouchPad	$132.35
30637 LifeTime Wireless Keyboard w/Trackball	$108.71
Logitech	
32639 Logitech Cordless MouseMan Pro	$70.45
31166 Logitech MouseMan '96	$43.91
25431 Logitech TrackMan Marble	$85.61
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37856 EasyBall w/Freddie Fish 1.0	$48.98
44695 MS IntelliMouse for Office 97	$64.98
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37830 MS SideWinder 3D Pro Joystick w/Hellbender	$73.98
37850 MS Sidewinder Gamepad f/Win 95	$35.98
31788 SideWinder 3D Pro	$65.98
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32555 ACM Game Card	$30.53
39948 ThrustMaster F22 Pro Flight Control	$129.41
32601 ThrustMaster FCS w/Fleet Defender	$65.29
32600 ThrustMaster FormulaT2	$117.59
Wacom	
23390 ArtZ II 12x12 (serial) w/Erasing UltraPen	$431.99
23388 Wacom ArtPad II (serial) w/Dabbler Bundle	$151.99
23387 Wacom ArtPad II (serial) w/UltraPen	$137.93

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82560 ACS-55 Gamina Audio System	$165.15
Bose	
31821 AcoustiMass Multimedia Pwrd Spkrs	**$588.98**
31822 MediaMate Shielded Multimedia Speakers	$299.98
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86838 SRS-91 Speakers	$135.98
32804 SRS-PC21 Speakers	$24.98
32805 SRS-PC41 Speakers	$54.98
Yamaha	
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83857 YST M7 Speaker (Platinum) – 10w	$42.50
85800 YST-M15 Powered Speakers (Black)	$68.75
87498 YST-M15 Powered Speakers (Platinum)	$68.75

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Iomega	
32073 Ditto 3200 Parallel Port	$279.95
26169 Ditto Easy 800MB External Par Port Tape Drive	$109.95
25659 Jaz 1GB External Drive	**$389.85**
25658 Jaz 1GB SCSI Insider Drive	$299.95
22339 Zip 100 Parallel Port	$149.95
91825 Zip 100 SCSI	$149.95
Promise Technology	
32076 EIDE 16Bit ISA Ide Disk Controller	$46.60
27523 EIDE 2300 Plus Disk Controller for VLB	$46.60
27525 EIDE 4030 Plus Disk Accelerator for VLB	$118.29
27524 EIDE Max Disk Controller	$22.70
Synnex	
36320 Universal PC Hard Drive Mounting Kit	$2.30
SyQuest	
36341 SyJet 1.5GB Enhc'd Parallel Drive	$528.98
36328 SyJet 1.5GB Int IDE Drive	$398.98
33347 SyQuest EZFlyer 230 Parallel	$199.98

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Creative Labs	
47525 Sound Blaster Value AWE64/1800	$239.98
47526 Sound Blaster Discovery AWE64/2400	$269.98
Hi-Val	
42341 Hi-Val 16X Basic MultiMedia Kit	$260.23
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36157 Multispin 8Xe CD-ROM Drive	$379.98
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36337 Ditto 2GB Tape Cart 3-Pack $59.95
36336 Ditto 2GB Tape Cart Single $19.98
34701 Ditto 3200 Cart Single $49.95
83370 Jaz Media 1GB Pre-Formatted $124.95
22338 Zip Media PC100 10-Pack $149.95
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26184 Zip Zoom SCSI Accelerator $49.95

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83580 CDR-74 Media $5.88

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39173 CD-R 74-min Media $4.98

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Performantz
40359 SyQuest Compatible EZ135MB Cart $14.98

Philips
89805 CD-R 74-min Cart $4.49

Sony
14368 Sony CD-R 650MB (74-min) $5.59
14358 Sony DG90M 4mm Data Cart 2GB $6.34
14397 Sony QD6525 1/4" Data Cart 525MB $20.06

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33325 EZFlyer 230 Cart 10-Pack $238.95
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34705 EZFlyer 230 Cart Single $29.98
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36330 SyJet Cart 3-Pack $319.98
36331 SyJet Cart 5-Pack $519.98
36329 SyJet Cart Single $124.98
97992 SyQuest 270MB 3.5" Removable Cartridge $52.98
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24998 SyQuest EZ135MB Cartridge (PC or Mac) $23.98

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21922 Verbatim CD-R (74-min) 4X $4.98

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Evergreen Technology
30349 Evergreen 586/133 .... $100.57

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27544 CPU MAXimizer 486DX4-100 .... $97.83
30811 CPU MAXimizer 586-133 .... $119.57

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32015 Intel Pentium Overdrive 120/133MHz for P60/66 .... $186.43
32018 Intel Pentium Overdrive 166MHz for P100 .... $405.63
28155 Intel Pentium Overdrive 63MHz $135.16
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94393 APC Prof Surge Arrest 7 Outlet w/Phone $31.92
99364 Back-UPS 400 .... $140.77
26812 Back-UPS 650 Pro PnP $278.88
85595 Back-UPS Office $199.87
83574 Back-UPS Pro 280 PnP $140.78

Best Power
38891 Fortress II 520VA UPS $313.60
38892 Fortress II 720VA UPS $324.03
38895 Fortress Rackmount 1020VA UPS $505.64
38893 Fortress Rackmount 720VA UPS $413.01
38889 Patriot Plus 650VA UPS $258.10
38890 Patriot Plus 920VA UPS $376.26
38887 Smart Patriot 280VA UPS $85.58
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34526 OPTI-UPS 280 PnP Uninterruptible Power System $96.09
34527 OPTI-UPS 420 PnP Uninterruptible Power System $144.13
25890 OPTI-UPS 650E Uninterruptible Power System $220.11
30718 OPTI-UPS 1000E $315.08

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42939 AC-S10 AC Set $79.98
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42915 PC Companion C120 .... $399.98
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42941 Velo 1 Handheld PC $739.98
42944 Velo 2MB DRAM Miniature Card $129.98
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42942 Velo Dock $79.98
42947 Velo NiMH Rechargeable Battery Pack $49.98
42946 Velo to PC Traveling Cable $39.98
42943 Velo Type II PC Card V-Module $99.98

Mobile-Combo Modem/Network

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41189 Combo Card $314.98
44262 XJACK 33.6 PC Card Modem $200.00

Mobile-Network Cards

IBM
38810 10T EtherJet PCMCIA Adapter $114.86
38812 10T/10B2 EtherJet PCMCIA Combo Adapter *$143.48*
25649 Token Ring PC Card Adapter $302.17

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24846 XJ 10BC PCMCIA X-Jack 10T/BNC $121.74

Socket Communications
21523 EA+ 10BaseT PCMCIA Ethernet Adapter $114.12
19935 EA+ PCMCIA Ethernet Adapter $142.37

Xircom
21066 PCMCIA TR 16-bit $345.67

Mobile-SCSI/Serial Adapters

Fujitsu
30803 LAN/SCSI Combo PC Card $175.27
30804 SCSI 600 PC Card $72.52
30809 Serial PC Card Adapter $66.48

New Media
39622 Basics SCSI (DB-25) PCMCIA Adapter $87.21

Socket Communications
19936 I/O PCMCIA Serial Adapter $135.37
34594 Infrared Serial Adapter $159.98

Mobile-Portable CD-ROMs

Addonics
35350 Portable 4X4 CD-ROM Changer $363.64

Fujitsu
36258 EigerMedia 6x CD-ROM w/PCMCIA Adapter $318.18

Microsolutions
35366 Backpack PD/CD-ROM Drive $463.64
31079 Backpack Plug and Play 4X CD-ROM Drive $193.18
31890 Backpack Plug and Play 4X CD-ROM Drive w/Sound $257.95
35363 Backpack Plug and Play 8X CD-ROM Drive $275.00
35352 Backpack Plug and Play 8X CD-ROM Drive w/Sound $345.45

Mobile-Multimedia Cards

AIMS Lab
40400 Grabit Video Capture $119.32

AITech
30634 Pocket Scan Converter $96.70

New Media
39624 Basics GAMEport $56.82
30316 Gamejammer PCMCIA $170.45
35105 Laptalk Stereo Speakers $45.45
26023 WAVjammer 16-bit PCMCIA Sound Stereo $204.55

Mobile-Hard Drives

Simple Technology
39153 1.08GB for IBM ThinkPad 355, 360, 750 .... $453.41
37770 1.3GB for IBM ThinkPad 355, 360, 751 .... $507.95
37773 2.1GB for IBM ThinkPad 355, 360, 752 .... $622.73

Mobile-Cases

Targus
91934 Targus Leather Case with CPU Purchase Promo $73.86
06610 Targus Leather NoteBook Case - Black $88.23
06023 Targus Notepac Case Black $28.41
07454 Targus Universal PowerBook Case $59.09
44537 Targus Shuttle $179.98
84979 Targus Universal Deluxe Case $99.98

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14" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	Price
Hyundai DeluxScan 14S	13.2"	1024x768	0.28	50-100	VESA DPMS	#83278	$169.98
KDS 1450 Reconditioned	13.2"	1280x1024	0.28	50-90	VESA/PnP	#39130	$169.98
NEC MultiSync C400	11.8"	640x478	0.28	60-118	MPR II/Nutek	#27642	$295.98
Performantz 1400	13.2"	1024x768	0.28	60-120	VESA DPMS	#45559	$189.98

15" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	Price
Hyundai DeluxScan 15B	13.7"	1024x768	0.28	50-127	VESA DPMS	#37271	$229.98
KDS 1500 Reconditioned	13.8"	1280x1024	0.28	66-82	OSD/DPMS	#39137	$219.98
MAG InnoVision DJ-530	13.8"	1280x1024	0.28	50-120	MPR II/Jag Control OSD	#38737	$319.98
NEC MultiSync C500	13.8"	1280x1024	0.28	50-120	MPR II/Nutek	#86328	$389.98
NEC MultiSync M500	13.8"	1280x1024	0.25	55-120	Speakers, MPR II/Nutek	#86792	$379.98
Performantz 1500	13.7"	1280x1024	0.28	50-110	EPA/VESA	#45605	$289.98
Princeton E050	13.8"	1280x1024	0.28	40-120	FCC/MPR II	#35144	$285.98
Sony MultiScan 100sx	13.9"	1024x768	0.25	50-120	EPA/MPR II/Nutek	#82686	$369.98
Sony MultiScan 100sf	13.9"	1024x768	0.25	50-120	EPA/MPR II/Nutek	#82687	$419.98
ViewSonic 15GA PerfectSound	14"	1280x1024	0.27	50-160	Speakers, FCC/MPR II	#23484	$389.98

17" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	Price
MAG InnoVision DJ-700	16"	1280x1024	0.25	50-110	MPR II/PnP	#38736	$599.98
NEC MultiSync M700	15.6"	1280x1024	0.25	60-120	Speakers, MPR II/Nutek	#86793	$769.98
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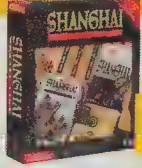

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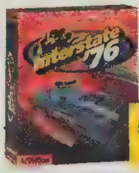

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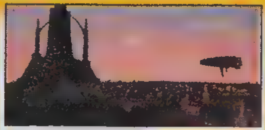

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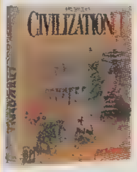

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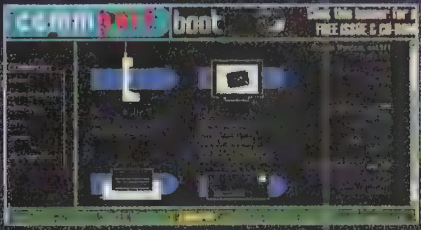
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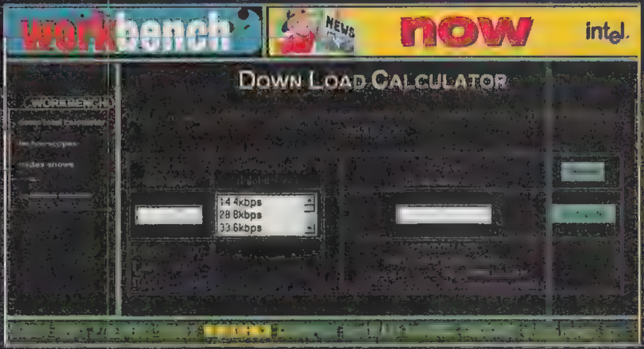
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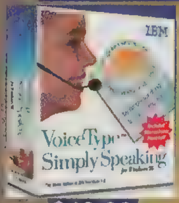

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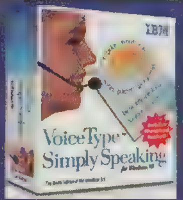

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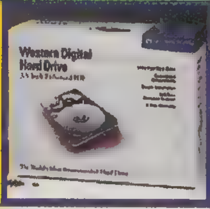

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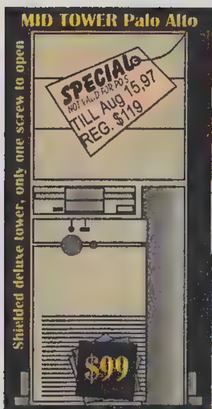

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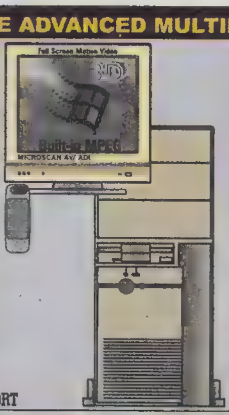

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*our usual slew of choice gems, including a **bootWorthy** roundup of the best **sound cards** and the massive dose of **p/reviews** you've come to expect from a horde of **PC-obsessed fanatics**.*

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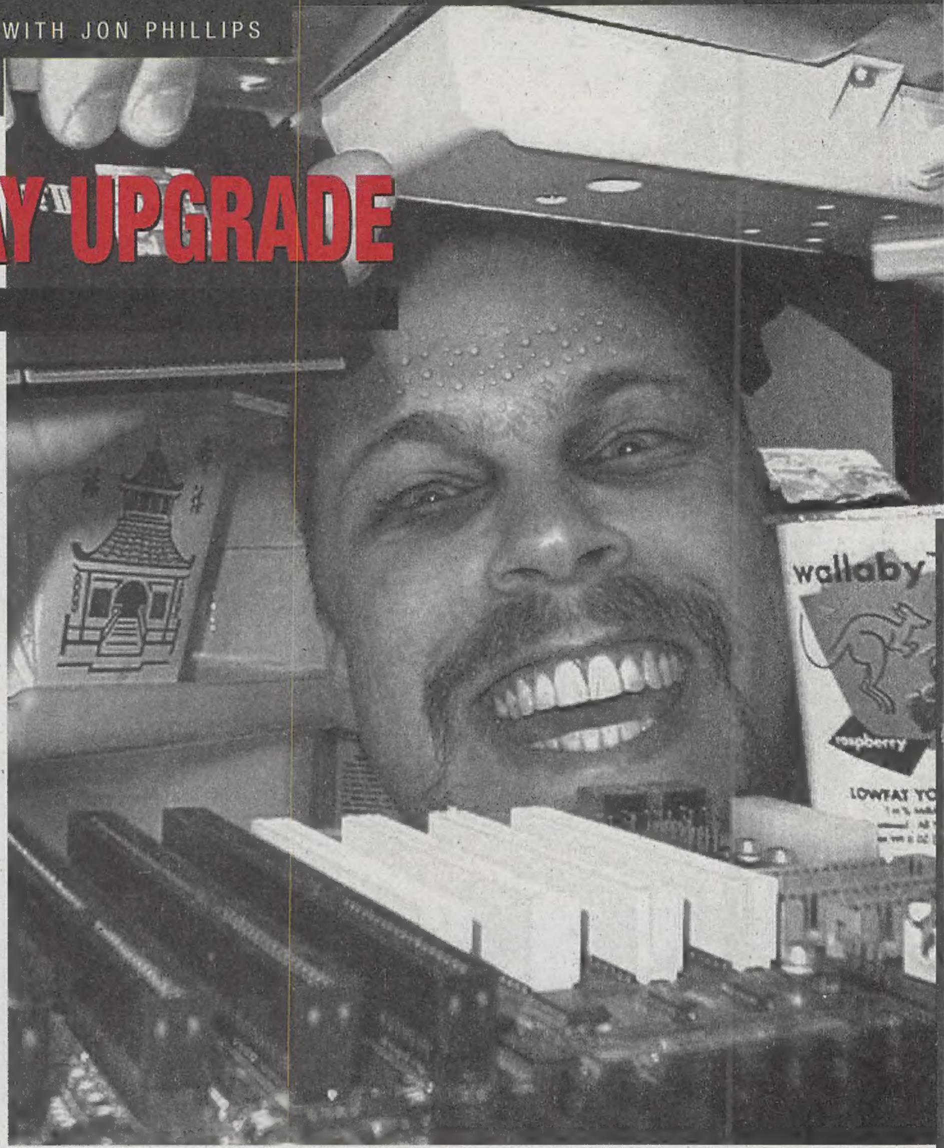
GLITCH WITH JON PHILLIPS

THE SEVEN-DAY UPGRADE

A JOURNAL INTO MADNESS



SUNDAY 11:11 PM John shut the lettuce crisper and powered up the computer. Even the largest tower ever made couldn't accommodate the illegal XXL formfactor motherboard he had commissioned from the Chinese government, so he was forced to stuff his components into an old refrigerator. Of course, the coolant did come in handy—12 Pentium IIs do not an Ice Capades make. The paltry 2048MB of EDO-DRAM was a bit underwhelming, but if John had requested any more slots from the Chinese, it would have meant sacrificing the egg trays. At least he could still revel in the MIPS 400 RISC chip that he had appropriated from his gutted N64. He didn't really need it, but it made a nice dedicated processor for the door light.

John went to bed that night on the verge of satisfaction. Who knows, maybe tomorrow he'd actually use the machine.

MONDAY 3:32 PM What good is a toaster oven if you can't use it to manufacture ceramic spacecraft tiling? John thought as he tightened the belt on his asbestos smock, and turned the makeshift plastic dial to 2400°. The thermometer rose steadily: 1500°, 1600°, 1700°. And then it stopped at 1775°. Jiminy Christmas. It couldn't be the power plant again—the Department of Energy had approved his request for 50,000 extra kilowatts. Nope, the problem must lie somewhere in the hardware.

"Hello, DeLonghi Toaster Ovens? Yeah, I've got a problem with my toaster—but I think I voided the warranty."

TUESDAY 6:35 AM John woke to the loud thwup-thwup-thwup of a prop plane flying landing patterns over his house. Bleary-eyed, he shuffled outside to find the aircraft taxiing down his street. When the plane came to a stop, John opened up the cockpit, congratulated the military personnel inside, and removed the flight log. Buenos Aires, Prague, Jakarta—the GPS had certainly done its job making sure the plane hit all of its international destinations. Thirty-seven thousand miles and 18 stopovers is a whole lot of air travel.

The modeling glue held up well, but those little plastic army men inside were a sickly shade of green. Of course, when your altitude ceiling is a mere 35 feet, you're bound to hit a lot of turbulence.

WEDNESDAY 4:48 PM It was to be the ultimate shot of espresso: Heavy mineral water forced through the finest ground Italian roast and a molecular filter of pores just 0.02 microns thick. But when John tried to push down the machine's brass lever, it wouldn't budge. So he called over Tom from next door, and then the boys from the fire department, but no go. Elbow grease just wasn't going to brew this pot of coffee.

When push came to pull, the wench from the downtown bridge project did the trick. Sure, the result was a 0.002cc shot of espresso, but who orders talls after 11 a.m.?

THURSDAY 11:18 PM John loved Thursday nights. Thursday was the night when he talked to all of his ham radio buddies. John loved his ham radio buddies, and his ham radio buddies loved him.

Sometimes they even dropped in late at night.

When the saucer port was clear.

FRIDAY 10:30 AM The automatic garage door opener had always fascinated John. So simple in design, yet so complex in character. Could it be that it actually defied upgrading? Nonsense. Its motor was only strong enough to open and close a garage door, and for a device expressly designed to open and close a garage door, this was woefully inadequate.

So John mothballed the stock electric motor that shipped with the unit, and dropped in the 350 that shipped with his '68 Chevy Malibu. When he took the newly cherried-out garage door opener for a test drive, it did seem faster, true enough. But it didn't seem... quicker. So John strapped on a nitrous kit, and the opener finally had some giddy-up.

John was now beating every other garage door opener in the neighborhood, off the line, from wire to wire. Grease monkeys began gathering around just to talk shop.

"Whaddaya think, John, slap a Holley four-barrel on that sucker?"

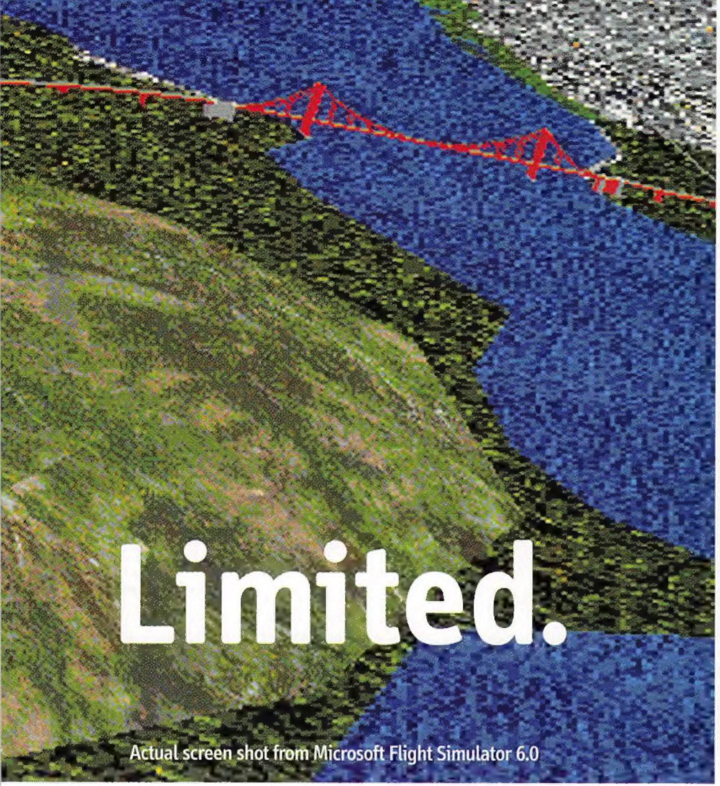
"Whaddaya think, John, chrome detailing?"

"Whaddaya think, John, new batteries for the remote?"

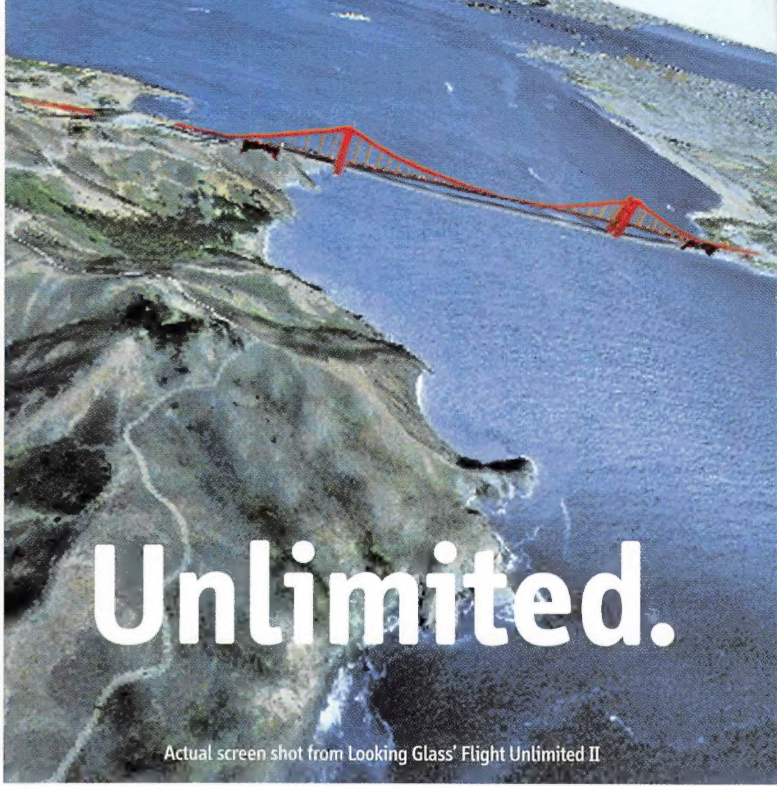
Too bad the door was made out of aluminum, though. Sliced through neighborhood cats like a cheese cutter through Harvarti.

SATURDAY 12:57 PM John was privileged with a Saturday appointment. No one ever got a Saturday appointment, but had John requested "the works," so Doc Peterson felt inclined to oblige. The doctor carefully walked John through the entire procedure, explaining known side effects, and describing the amount of pain John might feel once the anesthesia wore off.

Ouch. It sounded agonizing. Would the ultimate upgrade be worth the money? "Little" John Thomas was about to find out.



Actual screen shot from Microsoft Flight Simulator 6.0



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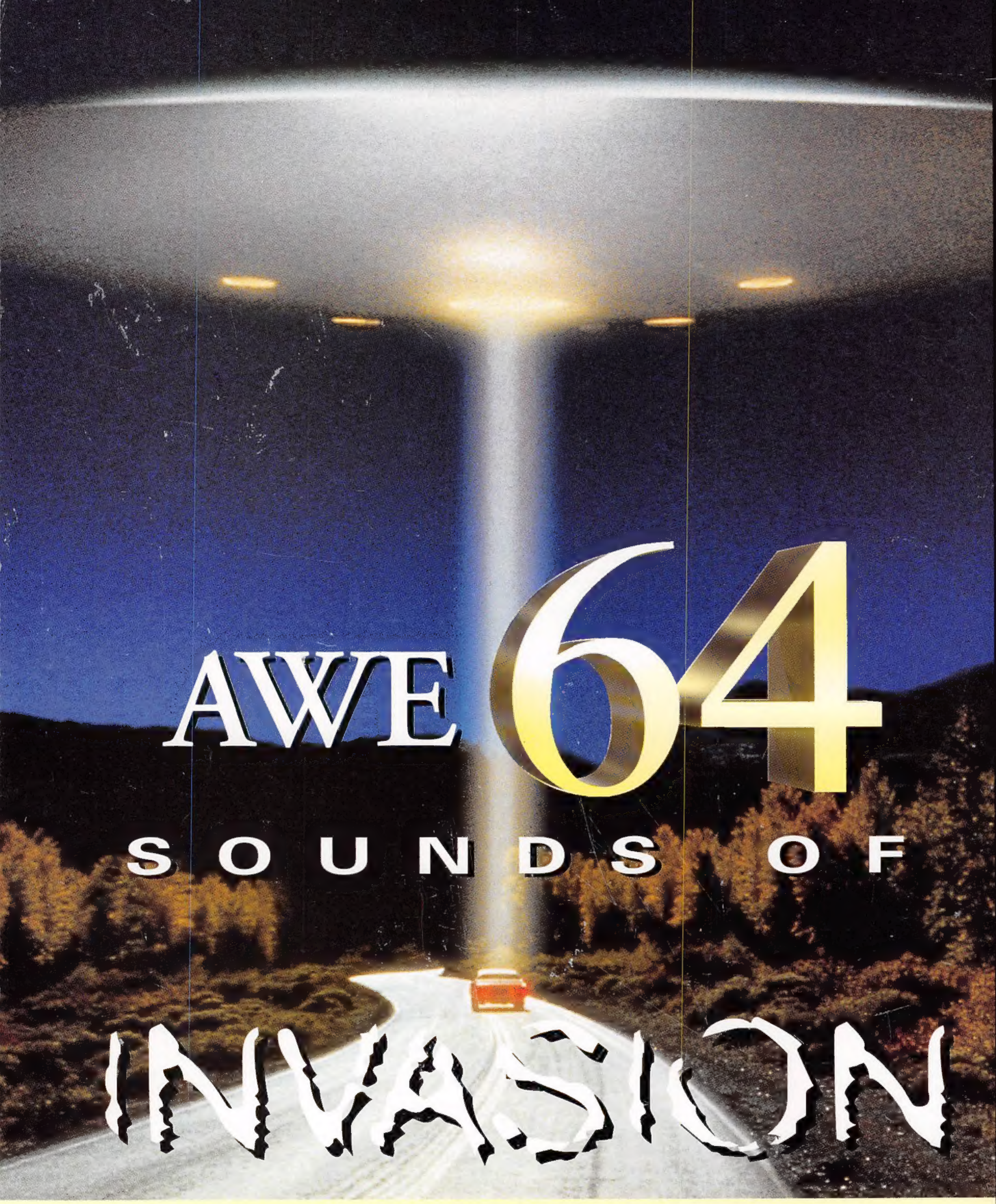

1. "We Come In Peace."
2. Blasting Ray Guns.
3. People Screaming.
4. "You Must Believe Me!"
5. Exploding Buildings.
6. Whirring Space Ships.
7. Brains Being Sucked.
8. Bones Crunching.
9. Aliens Phoning Home.
10. Metallic Scraping.
11. Cars Crashing.
12. Kidneys Bursting.
13. Insertion of Probes.
14. Heads Exploding.
15. "Run for Cover!"
16. "Warning."
17. Aliens Melting.
18. Pods Hatching.
19. Destroying the Monster.
20. Buildings Imploding.
21. Spaceships Docking.
22. Boiling Flesh.
23. "Mayday, Mayday!"
24. Exploding Spaceship.
25. People Running.
26. "I saw a UFO!"
27. Planes Taking Off.
28. "We're at DefCon 4."
29. Aliens Communicating.
30. Children Crying.
31. Slurp.
32. Clinking of Autopsy Instruments.
33. Laser Swords Crashing.
34. "Hyperspace!"
35. Flesh Being Torn Off Bones.
36. "They're Coming."
37. Wailing Sirens.
38. "You Must Die."
39. "Beam Me Up."
40. Zap!!!
41. Air Locks Closing.
42. "Oh, My God!"
43. Lasers Charging Up.
44. "We Need More Power!"
45. Ray Guns Blasting.
46. Calling the Mothership.
47. Horns Blaring.
48. "We Won!"
49. "Lock on Target!"
50. Crystals Charging.
51. Area 51 Guard: "No Admittance."
52. Zap-Zap!
53. Warning Alarms.
54. Air Locks Opening.
55. "Set to Stun!"
56. "Red Alert!"
57. Shields Up.
58. Warp Speed.
59. "Blast 'em!"
60. Eyeballs Squishing.
61. Spaceships Cloaking.
62. Radar Ping.
63. "Fire at Will!"
64. "Take Me to Your Leader."

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